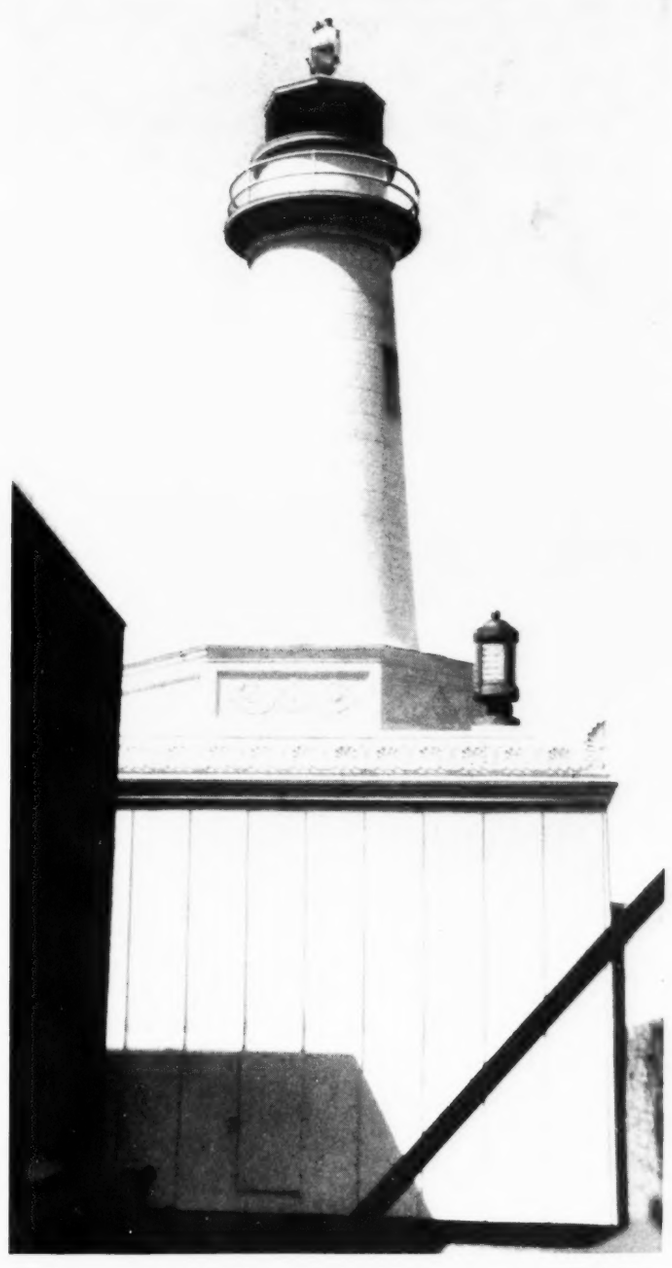
American Artisan

THE WARM AIR HEATING AND SHEET METAL JOURNAL

FOUNDED 1880

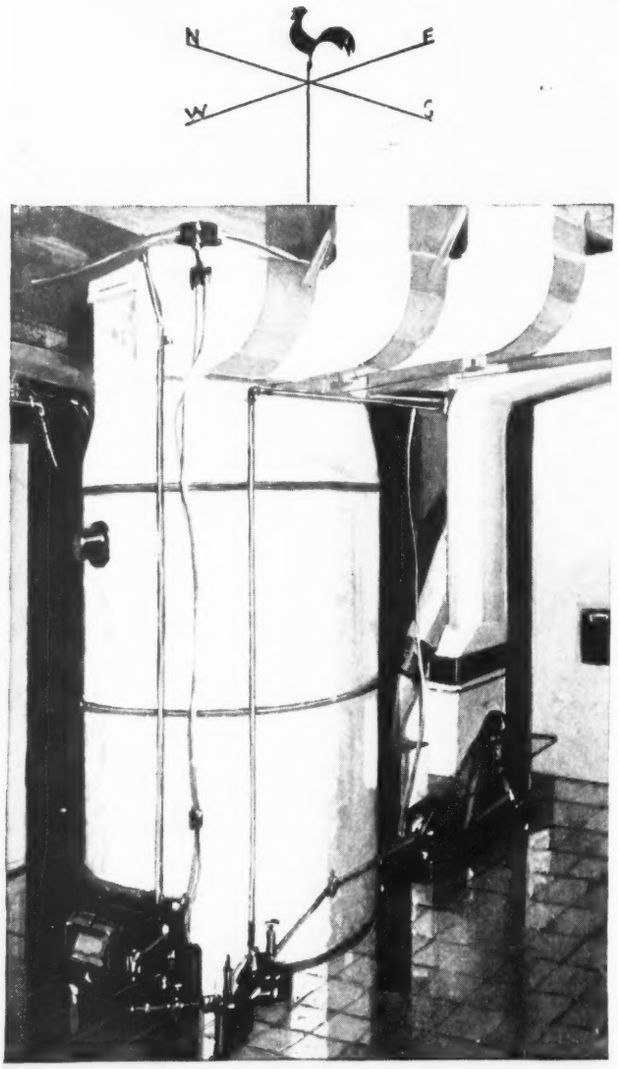


This is not a light house, but the beacon on top of the Beacon Life Insurance Company office building in Tulsa, Oklahoma. The tower is typical of the sheet metal work done by readers in the Southwest

MAY 11, 1931

"Weather Control"

All in One Unit



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Send me at once, full information on the "Weather Control" Oil-Burning Heating and Ventilating System. I am not obligating myself but will study the details carefully.

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"You're money ahead with *Kester*, Man!"

THE only way to make money in this business is to have the work coming in steady. And the only way to get steady work is to build yourself a reputation for doing the job *right* every time! Kester will help you, man!"

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Published Every Other Week by Porter-Spofford-Langtry Corp., 139 North Clark Street, Chicago, Illinois. AMERICAN ARTISAN—the Warm Air Heating and Sheet Metal Journal—entered as second class matter, January 29, 1930, at the Post Office at Chicago, Illinois, under the act of March 3, 1879. Formerly entered on June 25, 1887, as American Artisan and Hardware Record.

INDEX PAGES—10 and 56 [VOL. 100, NO. 10—$2.00 PER YEAR] BUYERS' DIRECTORY—52 and 54

Replacement work in

LUNCHROOMS...
CAFETERIAS...
ROADSIDE STANDS... *need easy-to-clean*
Monel Metal equipment that you can make

Sheet metal contractors are also making Monel Metal food service equipment for modern drug stores.

Steam table top and bain marie pan of Monel Metal. Jobs like this are splendid advertisements for the fabricator.

NOW IS THE TIME TO SELL COUNTERS...HOODS...TABLES... SINKS...DISPLAY EQUIPMENT AND OTHER PROFITABLE FOOD SERVICE UNITS...

HAVE you ever realized what a profitable market there is for Monel Metal food service equipment among the established restaurants, lunchrooms, cafeterias, "diners" and tearooms? There is a constant demand from this field for new equipment to replace old, worn-out units...range hoods, table tops, counter tops, sinks and similar items that have seen better days.

Monel Metal will help you get this business. Restaurant owners realize that food service equipment must be modern and inviting because much of it is often in full view of patrons. They know from experience that equipment should retain its attractive appearance despite hard use and repeated cleaning.

You can readily show these prospects how Monel Metal fills this bill in every particular. Monel Metal's silvery appearance always appeals to the most critical patron. Its glass-smooth surface can be kept spick and span with minimum cleaning effort, for this high Nickel alloy cannot rust and is highly resistant to food acid corrosion. Moreover, Monel Metal never loses its gleaming attrac-

MONEL

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

Say you saw it in AMERICAN ARTISAN—Thank you!

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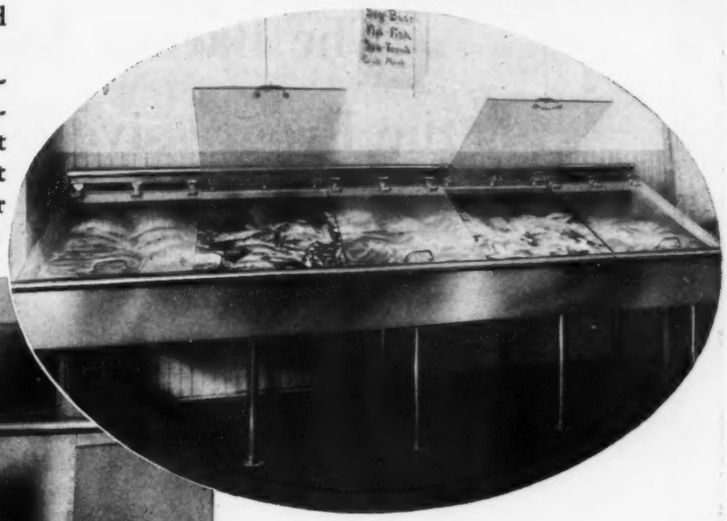
Heavy duty Monel Metal restaurant kitchen sink.

This gleaming array of Monel Metal equipment was made by a prominent Toledo, Ohio, sheet metal contractor.

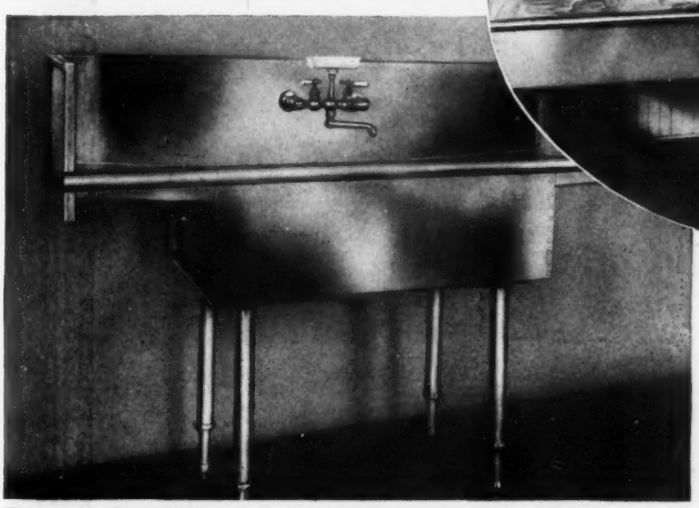
tiveness, because it is strong as steel, with no coating to chip, crack or wear off.

Monel Metal's beauty and durability are due largely to its high Nickel content. When you bid on sheet metal work of any kind remind your prospects that "Nickel Alloys Look Better Longer" and that Monel Metal is two-thirds Nickel.

Sheet metal contractors all over the country are making worthwhile profits fabricating Monel Metal food service equipment for replacement purposes. The market is growing. We will gladly send you further information about this lucrative business.



Above: *There are seven of these modern, easy-to-clean Monel Metal fish display cases in one Connecticut store.*



This attractive Monel Metal sink shows the kind of work progressive sheet metal workers turn out.

METAL

INCO MONEL METAL TRADE MARK

Monel Metal is a registered trade mark applied to a technically controlled nickel-copper alloy of high nickel content. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

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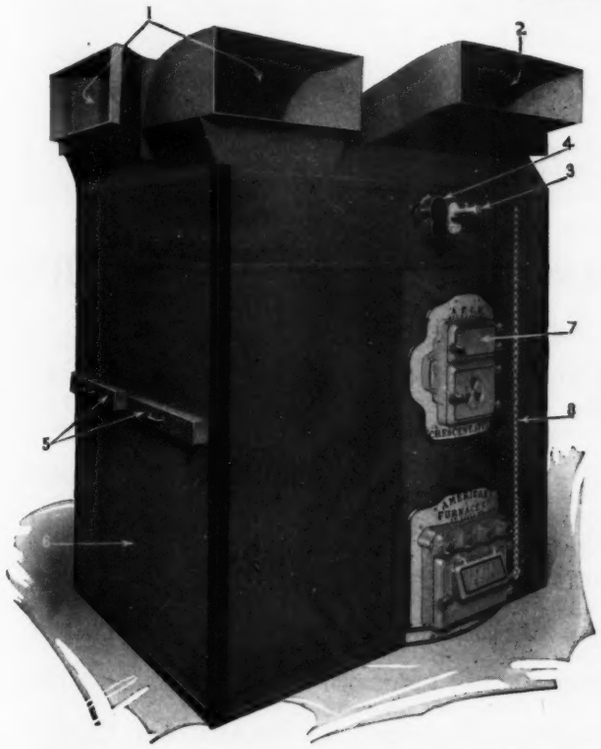
It's good business judgment to take advantage of the bigger opportunities that the new and modern "AFCO" warm-air heating equipment makes possible.

Each type of building has a different heating requirement and it requires a furnace designed especially for its needs —"AFCO" supplies it. There is the Thermo Cast furnace for the domestic installation that depends on price. The "AFCO" Boiler Plate Furnaces—made in three types—represent the finest gas-tight long-life furnaces that can be offered for quality installations.

The "AFCO" De Luxe Healthful Heating Unit —8 Important Features



Complete units include the "AFCO" De Luxe Healthful Heating Unit with all the latest devices for supplying automatic healthful heat and the "AFCO" Duo-Blo Industrial Unit Heater, the efficient heating system for all kinds of big heating jobs.

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Architect's drawing of St. Joseph's Convent, Pittsford, N.Y. Anaconda Copper for valleys, flashings, gutters and downspouts, installed by the Ballard firm, and supplied by The Rochester Brass and Wire Works, distributors. Joseph P. Flynn, Architect.

George Ballard, prominent Rochester, N. Y., sheet metal contractor.

"I *consider* ANACONDA COPPER *a dependable standby,"* says GEO. BALLARD

GEORGE BALLARD, a prominent Rochester contractor and live-wire in State Association activities, enjoys a substantial and growing volume of business, of which he writes:

"I consider Anaconda Sheet Copper a dependable standby in my business. When I use it I know that the job I've done will make friends for me, as well as profits. I have found that the way to build up a good, permanent business is to sell *Quality.* Anaconda advertising helps me do that —and sheet metal work of Anaconda Copper lives up to all my promises."

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from mine to consumer

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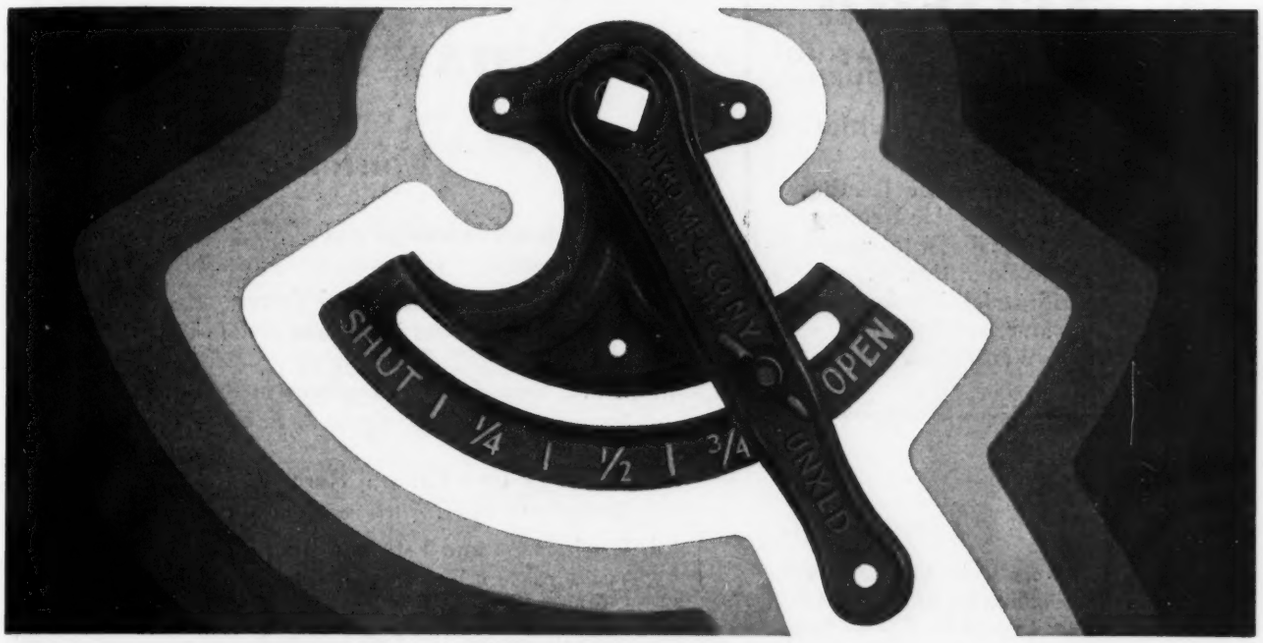

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IT'S the *standard*, and the *best* . . . is the Hyro UNXLD Damper regulator. Sheet metal men everywhere . . . from the fellow that lays out the blueprints down to the man who wields the pliers on the job . . . prefer it, because they know they can depend on it. It does its particular job the way it should be done . . . gives positive damper control . . . tells the position of the damper at a glance . . . is adjusted in a jiffy merely by loosening and tightening a wing nut. And in addition it's a cinch to install on both curved and flat surfaces . . . never goes on the blink. Wherever there are dampers . . . big or small . . . on warm air heating, ventilating, blower or exhaust systems . . . in residences, public buildings or factories . . . there's the place for the Hyro UNXLD Damper Quadrant . . . and there you'll find it . . . in thousands of representative cases. Get the habit of specifying and using the Hyro UNXLD Damper Quadrant on every job . . . if you don't do it already.

Hyro UNXLD Damper Quadrants have an electro-galvanized finish and are made to fit 3/8" and 1/2" square rods or Hyro Damper Bearings. For large dampers special Hyro Heavy-Duty Damper Quadrants, to fit 5/8", 3/4" and 7/8" square rods, in either black or electro-galvanized finish, are available.

5-31

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Mention AMERICAN ARTISAN in your reply—Thank you!

Founded 1880

American Artisan

THE WARM AIR HEATING AND SHEET METAL JOURNAL

Covering All Activities
IN
Gravity Warm Air Heating
Forced Warm Air Heating
Sheet Metal Contracting
Air Conditioning
Industrial Roofing
Merchandising
Ventilating

VOL. 100, NO. 10

MAY 11, 1931

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If you are serious about studying the engineering of heating you will want to read G. A. Voorhees' article on formulas in this issue. This is a mighty important and valuable contribution. Questions and discussion are invited.

* * * *

We conclude in this issue the discussion on the forced air system which does not work. There are a number of solutions accompanied by drawings. If you have been following this discussion you will find here several valuable ideas.

* * * *

There is a nice galvanized iron job told about this issue. If you think iron is losing ground read this and see how readers in the Southwest use iron.

JOSEPH D. WILDER
Editor

Published Every Other Monday

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PORTER-SPOFFORD-LANGTRY CORPORATION
139 North Clark Street, Chicago— Telephone Central 7670

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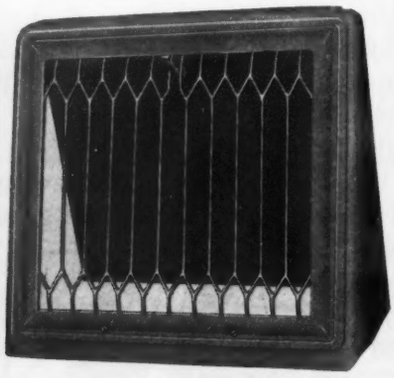
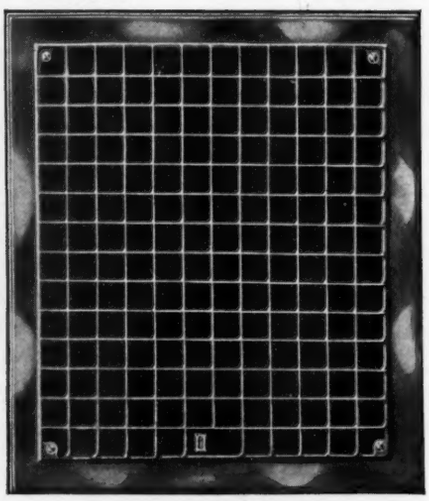


PANAMA BASEBOARD REGISTER
At last—a beautiful Bartype Register



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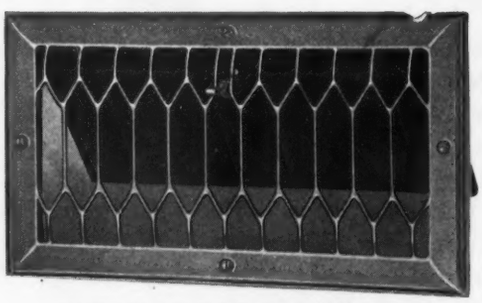

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We offer the ***Panama Forced Air Convex Registers*** to those engaged in this class of installation. Adopted and approved by the biggest and most successful operators in forced air conditioned work.
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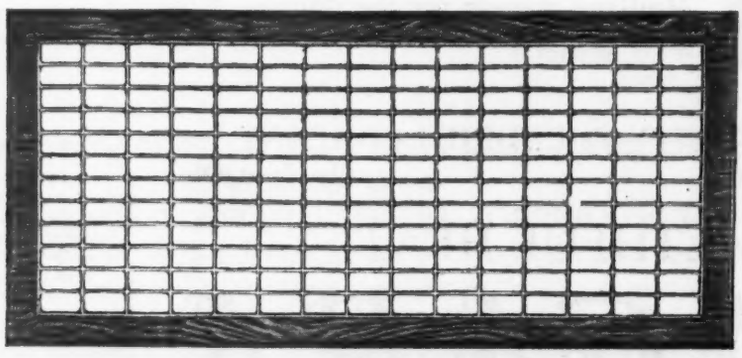
A perfect pressed, embossed and reinforced steel face. A splendid substitute for wood faces and last a lifetime. *(Get our latest catalog and prices.)*



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Volume 100

American Artisan

THE WARM AIR HEATING AND SHEET METAL JOURNAL

Number 10

The Large House Heating Field

SEVERAL times last year we called attention on this editorial page to a condition which had been brought home to us in our travels over the country.

That condition is the continued construction of what can be termed—expensive homes. To be specific, the house costing from $25,000 on up.

Since last fall additional traveling has disclosed that this type of house has been built not only last year—a year of depression—but also all winter long!

Investigation has brought out that building permits from cities all over the country show a continued construction in this field. It is evident, therefore, that people with money are building and remodeling their homes.

Another feature of this situation is the interesting observation that most cities have one or more districts where this type of house is being built and that construction in such districts has topped all other residential building during the past several months.

Practically every city visited lately, and by the way, that means quite a few, has shown that these same districts of expensive homes are being heated for the most part by steam, vapor and hot water.

Discussion with contractors has brought out the statement that most of these houses are designed and equipment specified by architects and that architects are ignorant of, or afraid of, or too high hat to use warm air.

That condition proves that our heating contractors have not had the nerve, or the ammunition or the prestige necessary to break into this profitable field.

It might not be out of place, then, to discuss these three needs just a little.

First, the nerve. Of course we don't mean lack of courage. What we do mean is that the contractor too often is not sure enough of his sales ability, his personal appearance, his ability to talk good English to enter an architect's office and talk heating.

The impression is prevalent that the architect high hats the warm air furnace man.

In many cases he does.

Why?

Because he is thinking and planning in terms of color, form, design, background, etc., while the furnace man is thinking in terms of galvanized iron, stacks, leaders, grates, registers, etc.

These two things are too far apart.

What will bring these two minds together must be done solely by the furnace man. It is up to him to forget pipes, leaders, grates, stacks and talk about the product of the use of these things.

For instance.

The architect plans his living room with the furnishings in mind. The last thing he wants is to have this plan all broken up because of a radiator or register or grille. So the heating man, then, should ask what the architect has in mind and then build to it.

The same procedure should be followed all through the house.

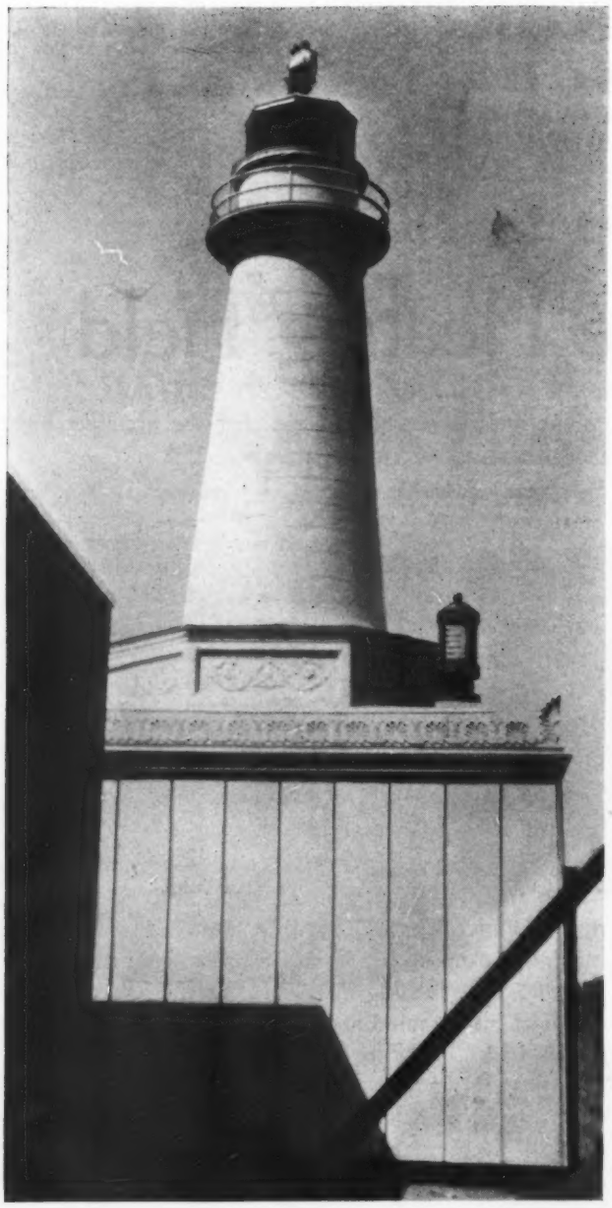
But, if the plant can't be built to the architect's ideas then the heating man should speak out. A thorough discussion of what can and can't be done before work starts is the best way for everyone to get started.

Then the ammunition. Best of all is a list of jobs satisfactorily serving people like those the architect is designing for. Next is some sort of literature written in the architect's language and of a quality equal to the literature he reads. Sad to say there is almost no such literature available.

That is where our manufacturers should help out.

Last, prestige. We admit that earlier warm air heating was too much "hot air." We are trying to live that old situation down and we are, but it will take time. The best way to overcome it is to show and talk our new heating until first one architect, then another, wants our type of heat.

If this issue of AMERICAN ARTISAN reaches you at home it is probable that you are not going to attend the National Association of Sheet Metal Contractors convention in Chicago. If you are not, watch for the next issue—it will contain a report of the proceedings and addresses.



The glistening white tower is a striking feature of the Tulsa business district. The square base is crimped iron. The casting and panels are standard stampings. The round section is white stucco

Beacon Iron

The photograph on the cover and on these pages and the details show what this tower looks like. It is not a large job, but it does show how metal can be used in places where other materials might be thought of first.

The tower supporting the light is just over 50 feet high. It begins at the roof line as a square base 13 feet high. This base is covered on the outside with small crimped galvanized iron fastened to girts. The vertical seams are all standing seam, hand locked. Necessary doors are cut through the sides and are of galvanized iron on metal frames.

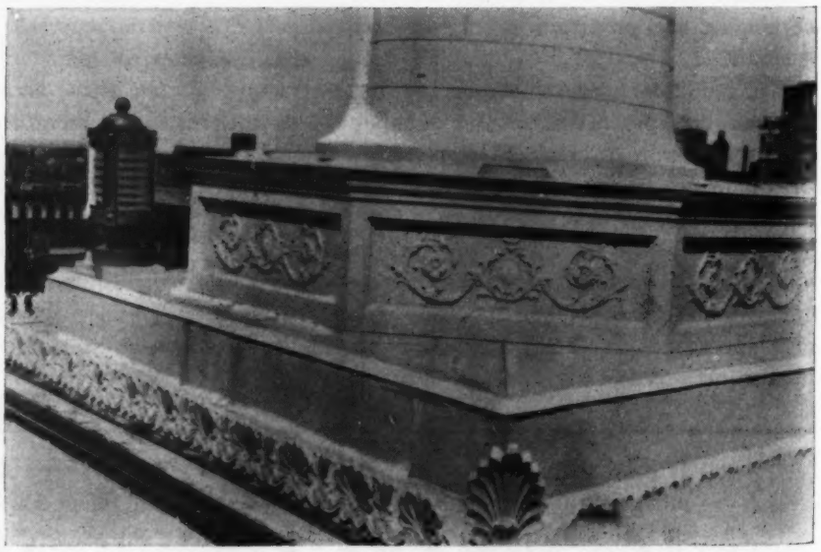
The top of this base is a narrow, flat deck also covered with galvanized iron. Around the top of the base there is a cresting braced at frequent intervals with formed iron. The cresting is alternate high and low leaves with the bracing placed behind each high leaf.

The corners of this deck have standing seams while all the other seams are flat and soldered.

DOWN in the Southwest sheet metal is used for practically everything. People use metal on interior walls and ceilings of their homes; metal forms, walls and roofs of all kinds of buildings and in industry metal tanks, bins, buildings and metal for ornamentation are used everywhere.

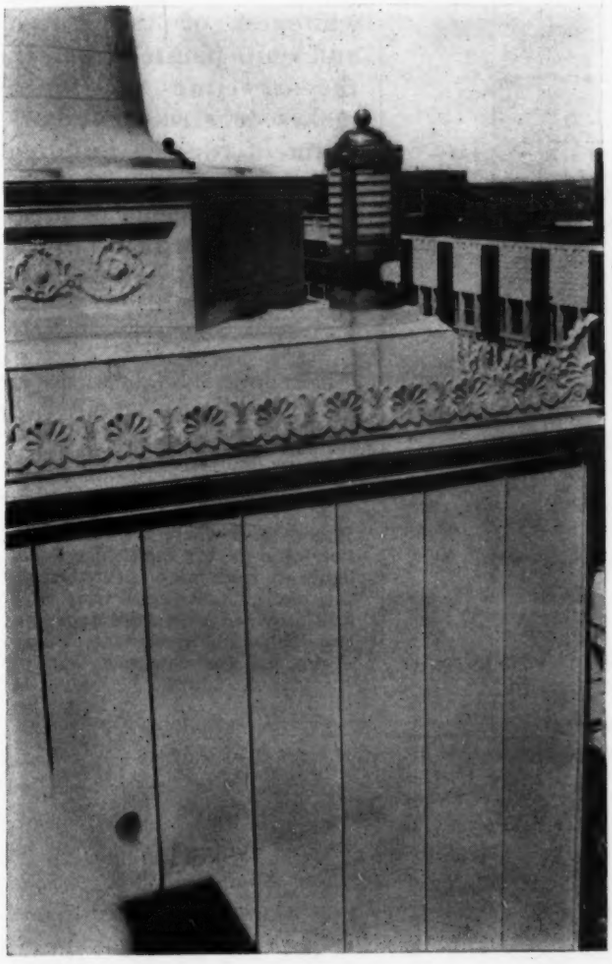
It is a metal minded country.

This familiarity with metal also extends to many of the architects. They use it for topping off buildings and for ornamentation. A good illustration of this is the beacon supporting tower which stands on the roof of the Beacon Life Insurance Company Building in Tulsa, Oklahoma.

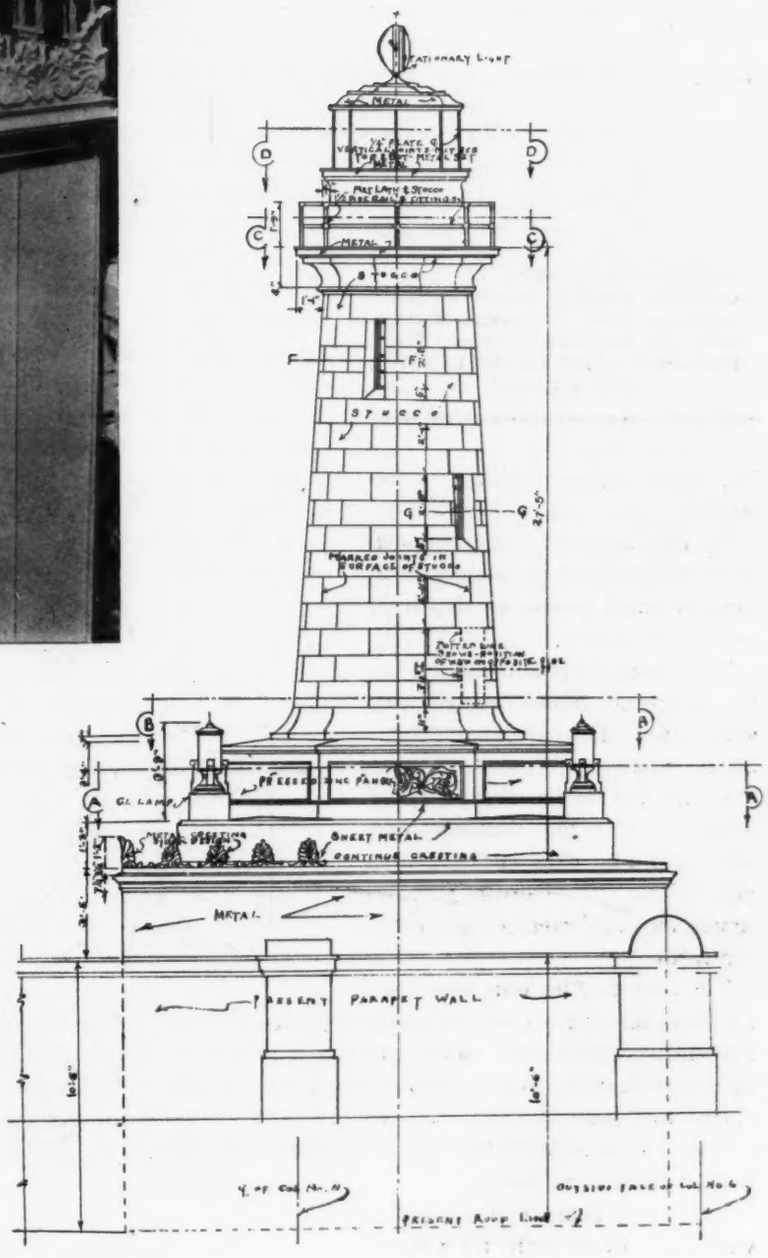


A closeup view of the base casting, octagonal section panels and two of the flat ducts. Deck seams are flat locked and standing seam

Tower, a Galvanized Ornamentation in Tulsa



Above — Another closeup view showing how the base and decks are joined by a formed iron cornice. Base vertical seams are standing seams for rigidity

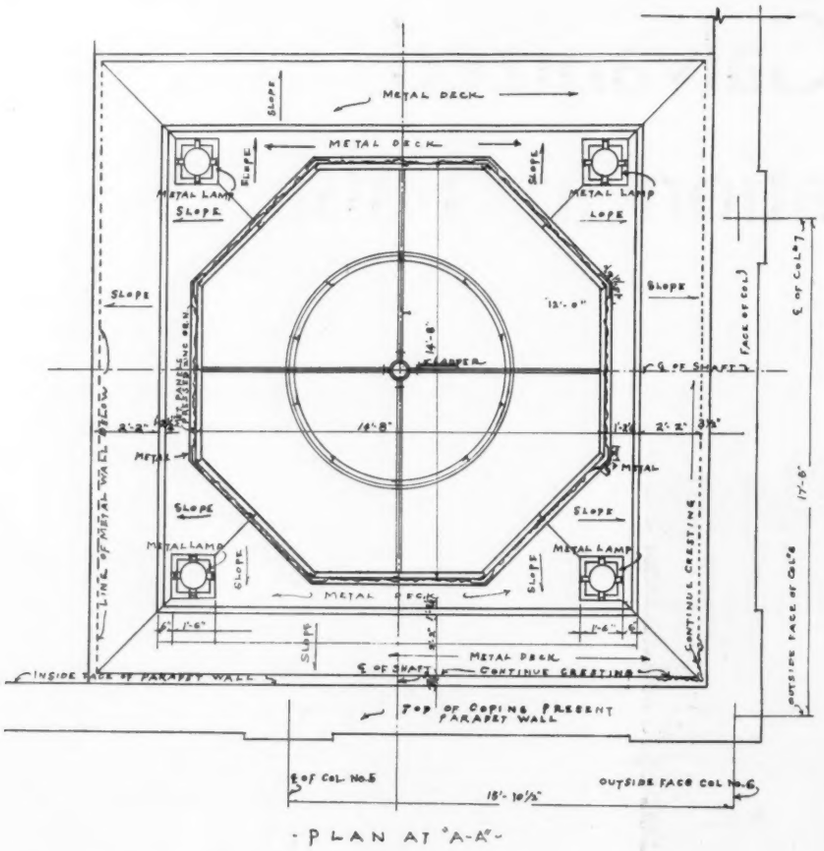


Right — Elevation of the tower, showing how and where iron was used to form the tower. The iron was painted white to match the stucco

A low step stands on this deck. This step is also flat and has ornamental lanterns at the corners. Seams here are identical with those on the deck below.

On this second deck the base of tower begins. At the deck the tower is octagonal changing to a round tower a few inches up.

The top of the octagonal deck is paneled between sections by standing seams. In each panel a round hole was cut and in this base a flood light is placed. These lights illuminate the round shaft from all angles.



Above — Plan drawing of tower deck are standing seams at the section at A-A. The seams of the mitre and flat locked between. The deck slope is just enough to provide drainage

This deck slopes 3 inches to the outside.

In the faces of the octagonal deck stamped zinc panels are set in metal formed panels as shown in one of the details.

The round shaft is metal lath on the structural frame covered with white stucco and paneled to resemble cut stone.

At the top of the shaft a metal cornice forms the ornamentation for a working deck enclosed in a pipe railing. This cornice was designed and fabricated by the metal contractor.

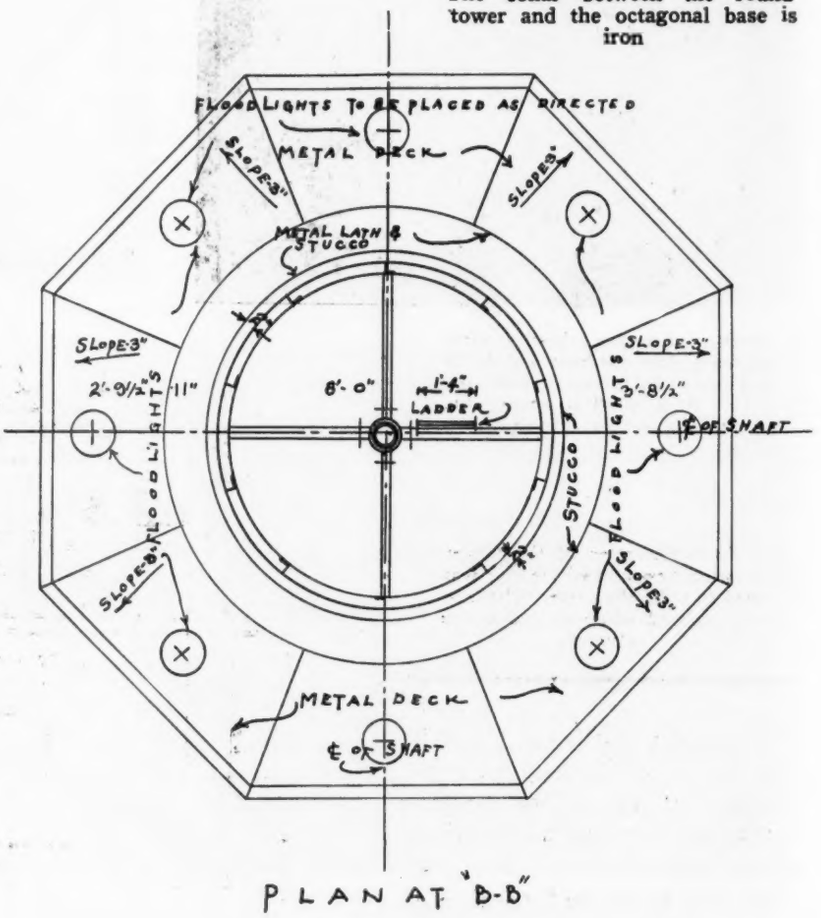
The base for the lamp stands on this deck and consists of a galvanized iron formed and seamed to show a smooth, round surface. Above this there is a lamp section protected by a metal roof on which the revolving lamp stands.

The color scheme of the tower is white to conform with the trim of the building. So all the metal work is painted white.

While the tower does not stand on a building which dominates the Tulsa skyline, it is conspicuous because of the glistening whiteness of the stucco and white painted iron. In the daytime the tower makes a striking advertisement for the building and the company. At night the beacon seems to identify the company to all visitors to downtown Tulsa

The contractor who designed and erected this tower is the Upton Sheet Metal works of Tulsa.

Plan at B-B where the round section joins the top deck. The floodlights are sunk in holes cut through this deck. Each light rests in a well provided with a drainage line. The collar between the round tower and the octagonal base is iron



SIMPLIFIED FACTS FOR GAS EQUIPMENT SALESMEN

By **L. W. MILLIS***

Heat Transfer

WHEN gas is burned in a furnace or boiler, a certain amount of heat is generated within the heater. Some heat is carried away by the smoke pipe while some is lost through the covering of the heater. The remainder is called "Available" heat. *Catalogs* of heaters claim anywhere from 65 to 83 per cent available at the bonnet of warm air furnaces or at the delivery nozzle of boilers. The heat must be transferred by some sort of piping from the heater to the registers or to the radiators. There are catalogs that actually claim 100 per cent delivery. So far as I am concerned they might as well have claimed 101 per cent or even more.

The "Standard Code" method of rating the capacity of warm air furnaces is based on 25 per cent loss between the bonnet and register. Of course some short pipes lose less and some long flat pipes lose more. But the Standard Code formula calls for an average of 25 per cent. I do not know of any uniformity of custom concerning piping loss for boilers. I know that many competent steam men allow from 20 per cent for covered piping to 40 per cent for bare piping for basement loss. It is not possible to use a fixed figure. Every job presents its own variables. You must find them for yourself. You will have all the losses you can see and some you cannot foresee.

Illustrations

Suppose 100 cubic feet of natural gas is delivered into a fire box, and that the heater has sufficient surface to absorb and deliver 70 per cent of it as "available heat." You then have 100 cubic feet times 1,000 B. T. U. per cubic foot of gas times 70 per cent efficiency equals 70,000 B. T. U. at nozzle or bonnet. If we allow 25 per cent loss for warm air from bonnet to registers there will be 52,500 B. T. U. delivered at the register or 52½ per cent.

If the 70,000 B. T. U. is delivered to the nozzle of a boiler and the piping loss is 40 per cent, the amount delivered will be 42,000 or 42 per cent. There can be no fixed rule.

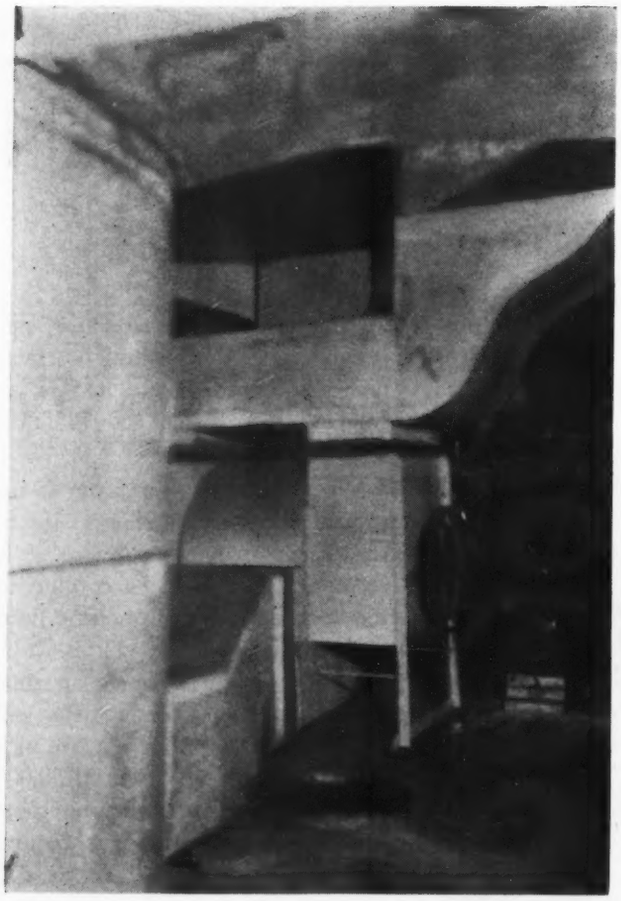
Heating plants of every description will be found with extreme efficiencies both good and bad. It is this feature that makes it difficult to compare different gas burning equipments. Much of the efficiency is in the heating plant itself. The heat given off by a *radiator,* per square foot of radiating surface, under standard conditions, is as follows: Hot water 150 B. T. U., Steam 240, Vapor Vac. 210.

When a warm air register is installed with its relation in size to the warm air pipe to which it is connected maintained according to the "Standard Code," the first floor register will deliver 111 B. T. U. per square inch of warm air pipe area and a second floor register will deliver 165 B. T. U. per square inch of its basement pipe area. If 50,000 B. T. U. is delivered at the room end of the pipes it will require 50,000 divided by 150 equals 333 square feet of water radiation or 50,000 divided by 240 equals 208 square feet of steam radiation to transmit the heat into the surrounding air in the room. If 50,000 B. T. U. be delivered through a warm air register on the first floor of a building the warm air pipe area would be 50,000 divided by 111 equals 454. If 25,000 B. T. U. be delivered to first floor registers and 25,000 B. T. U. be delivered to second floor registers the warm air pipe area required would be 25,000 divided by 111 equals 227 plus 25,000 divided by 165 (equals 151) or a total of 376 square inches of pipe area.

*President, Study Club, Security Stove and Manufacturing Company, Kansas City, Mo.

One more article is to appear in this series. Several important points have been raised so far, and perhaps you have some question which is puzzling you. This article, for example, points out that furnace capacity alone is not a true indication of sufficient heat in the house. You must consider piping loss. This accounts for under-heating in many instances. If you have a question, rite us or Mr. Millis for the answer.

Forced Air Heating



In order to heat the extended end rooms, a forced air system was used. The blower is connected to the casing by a large shoe

INSTALLING heating systems as a part of the widespread remodeling program which has been going on of recent years has become one of the most profitable fields served by warm air heating contractors. And one of the most profitable fields within the larger field of remodeling his proved to be replacement work in such establishments as club houses, funeral homes, schools and specialty shops.

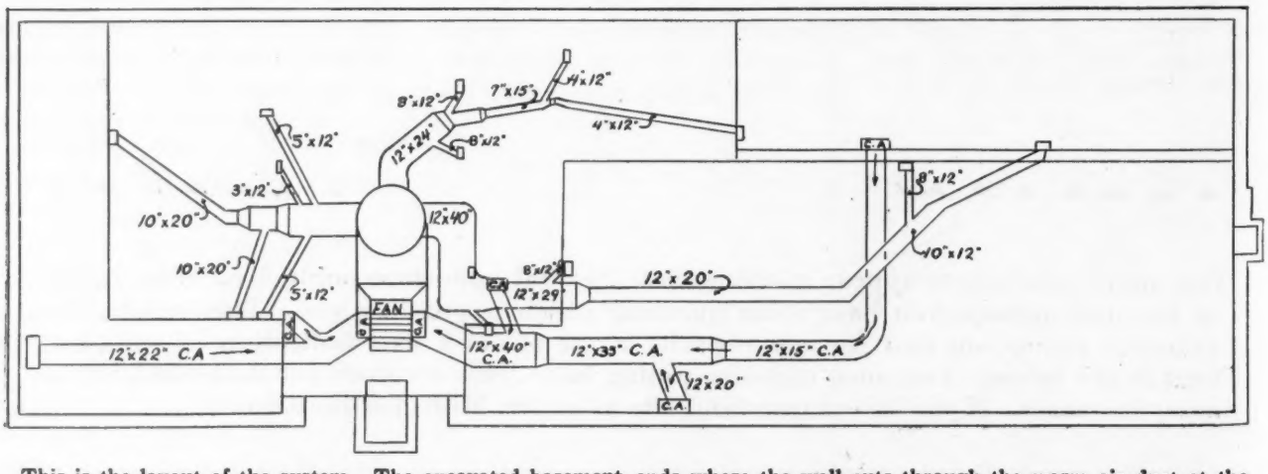
These larger places of business have opened the way for the sale of large heaters, forced air and complete automatic control. In many instances these remodeled establishments are built around an old house or a small store building with rooms added above, in front and to the rear. To heat such spread-out buildings the contractor is afforded the opportunity of selling forced air with its accompanying accessories.

An excellent example of such a remodeling project is the recently enlarged funeral home of Martin Ankenbruck in Fort Wayne, Indiana. This new establishment is built from an old house standing close to the business district. A one-story workroom and display room was added at the rear and some of the first floor rooms were thrown into a large reception room. In addition a glassed-in porch, requiring heat was added at the front.

As completed the new place of business requires heat to be brought from the furnace back through the end basement wall of the old house and through an excavated area to supply registers in the workroom and display rooms at the rear. These rooms are fed from two long trunks.

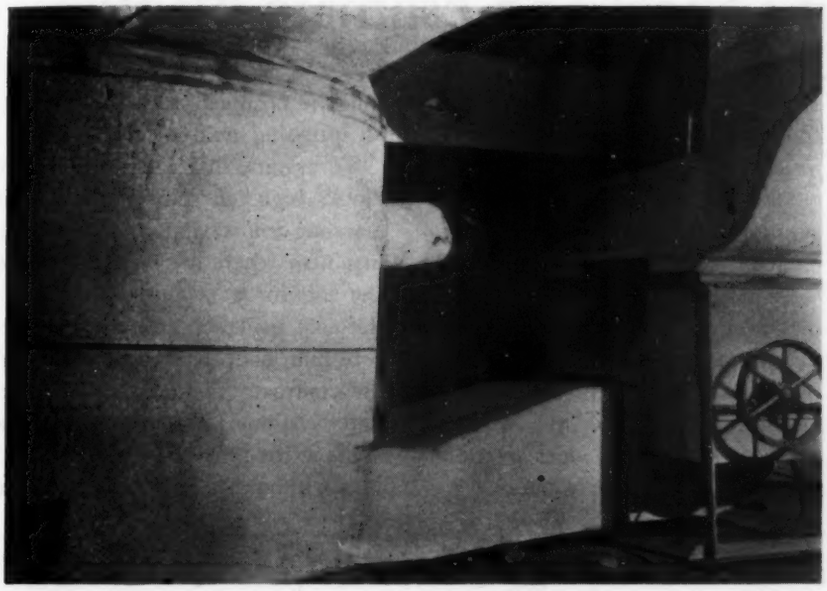
In order to supply the increased cubic content a new and larger furnace had to be installed. Forced air was also adopted in order to heat the rooms at the rear. The longest run is more than 75 feet from the furnace.

In supplying these registers which are over unexcavated area, a ditch



This is the layout of the system. The excavated basement ends where the wall cuts through the warm air duct at the right of the heater. Most registers are fed from comparatively short runs

Solves Problem of a Spread-Out Funeral Home



Return air is dropped into the blower wheel through a stub end box which feeds both ends of the wheel as shown in this picture

was dug through the ground. This ditch is not lined and the galvanized trunk is run through air space in the ditch. The trunk is held away from the dirt by special angle-iron braces which are fastened to the floor joists. The ditch was dug before the rear portion of the building was erected and the trunk was placed before the walls and interior was built.

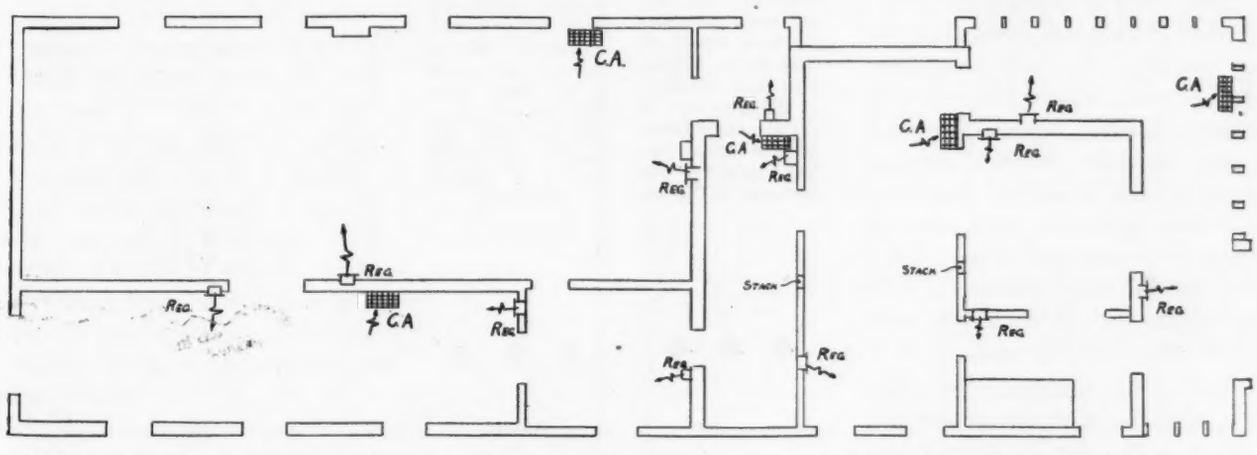
As reconstructed a Midland furnace is a round casing and with all warm air leads taken off in three trunks forms the heating unit. The blower used is a Furblo type L2 hooked into a special return air duct which feeds both ends of the wheel from the one feeder duct.

On the warm air side there are three main trunks. Two of these run to the back of the building, with one branch used to supply a second floor stack. Both these runs are long, but are so designed that most of the branches are taken off the trunks inside or at the basement wall, leaving three registers to be fed from the end of the runs. The outside run is the shortest and supplies one register in the workroom after passing through the cellar wall.

The other and longest run, supplies register in the workroom after passing through the cellar wall.

In the front of the remodeled house there are a number of rooms both on the first floor and on the second. To heat these rooms a number of branches were taken off the two long trunks and also the third trunk built through the center of the basement. This third trunk supplies most of the heat for the large reception room, the smaller retiring room and the glassed-in porch.

(Continued on page 33)



All registers are of the baseboard type while the return air grilles are in the floor. Each room has one register and the most important rooms a return air grille also

LET'S MAKE SOME MONEY

by BENJAMIN F. JOHN

The Job Work Sheet and Estimate Blank

WHEN successful business is so much interested in unit costs and spends money for forms to check and recheck them, is it not strange that many shops in our trades are so careless about their costs?

In reviewing the statements of 20 shops for 1930, it was found that in 9 shops if the small items had been checked on the WORK SHEET and included in the bills or estimates, the loss shown for the year would have been wiped out.

These statements showed the amount of material bought for the jobs and the amount charged on the bills for the year, as well as the amount of 52 weeks pay roll to the men, and the amount of labor charged on the bills. Both showed a loss. In two the loss amounted to $400 or more.

The larger items of material such as sheets, tin, copper, furnaces, etc., in nearly every instance were charged accurately, but the trouble lay in not charging enough of the smaller items or missing them altogether. These small items are many in number and easily forgotten, such as nails, cement, flux, asbestos, cleats, bands, hangers, guards, paint, oil, wire, electrical connections; elbows, shoes and many others. The failure to realize that all these items cost real money, and a few missed on a number of bills during the year do amount to quite a tidy sum, was the cause of loss.

During the discussion the claim was made that a certain amount was always added for incidentals and this amount covered any missing or forgotten material and labor, but the facts proved that when the bill or estimate looked "too high" this amount was dropped, because it was supposed that all else had been included, which proof showed all were not included by examination of the sheets.

It is easily understood that when the "boss" in the average shop looks over the sheets after the work is finished, he can and does overlook the small items, simply because his mind is occupied with the immediate pressing matters before him.

To assume that a bill or estimate "looks high" in spite of the cost is a wrong impression, and in several instances where a customer figured the job for a proposed work with the cost of labor and material before him, his prices were more than the contractor would have charged him. No one knows or can give a guess at the present prices of varied jobs without the true cost of all the

◆ ◆ ◆

This sheet lists the name and address of the job requiring material from stock. Below is space for an itemized list of every piece of material and every tool, no matter how small or how large. Workmen are required to fill this out in detail and leave at the office before taking the material to the job

◆ ◆ ◆

(Figure 1)

Job No.....

BENJAMIN F. JOHN CO.

ORDER FOR MATERIAL FROM STOCK

Philadelphia, ...192

For Mr. .....

For work at .....

Ordered by .....

Figure 2

(RED SHEET)

Job No.....

BENJAMIN F. JOHN CO.

RETURN ORDER FOR MATERIAL FROM STOCK

Philadelphia, ...192

For Mr. .....

For work at .....

Ordered by .....

material and labor set down in figures and carefully reviewed.

In these modern times, when the cost is quite a bit higher, due to the higher wage, the average shop is never safe, either in billing or estimating unless every item is included and checked and rechecked. To do this is well worth while.

The glaring fault in our trades today is the neglect to find and add enough for overhead, yet just as important is the neglect to check on material and labor sent to the job and recheck that which is returned.

It is very true that the average shop cannot afford to hire the services of an experienced person to make up and check the JOB WORK SHEETS, yet in nearly every shop there is a steady mechanic or driver, who can be taught to do this work, if he is given the proper sheets.

Fig. 1 shows a sheet on which all the different items of material and tools taken to the job are entered.

◆ ◆ ◆

The duplicate of the first sheet shown on the preceding page is a red, yellow, blue, or any other colored sheet. This is filled in when any left-over material and the tools listed on the white sheet are returned from the job. This gives a perpetual inventory of every job

◆ ◆ ◆

This sheet is filled in by the mechanic or the girl in the office and it shows what part of the materials taken for the job were used. It is a trial balance for the job. At the bottom is a time sheet for the workman

◆ ◆ ◆

When filled out the sheet is left in the office.

Fig. 2 shows a RED sheet or any other color but white, on which is entered all the material and tools returned from the job to the shop.

Fig. 3 shows the JOB WORK SHEET and Fig. 4 another JOB WORK SHEET which are given to the mechanic in charge of the work, which when properly filled out, equals the difference between sheets No. 1 and 2.

The experience in finding tin, coal, firepots, ladders, ropes and other material and tools on the job six months or a year afterward or on some other fellow's job, is still fresh in our minds, and represents loss, but when these sheets are adopted and properly checked, this loss is reduced to a minimum. A check up of these three sheets for every job as it is finished will quickly show up any missing or uncharged material.

If the steady man or driver is

Figure 3

BENJAMIN F. JOHN COMPANY

1003 RACE STREET

Roofing and Sheet Metal Work Sheet

PLEASE READ OTHER SIDE OF THIS SHEET

Order No. ..... PHILADELPHIA, ...

For Mr. .....

For Work at .....

TOTAL MATERIALS USED

Tin		Solder	
Spouting		Coal	
Elbows	Shoes	Putty	
Galvanized Iron		Paint	
Black Iron	Copper	Oil	
Eavepipes	Hanging Gutters	Nails	
Slate		Pitch	
		Felt	Slag

Please charge time below, day by day. Workmen handed this sheet will be held responsible for its correctness.

Date

WORKMEN														PAINTING	OUTSIDE	SHOP	CAR FARE

Figure 4

BENJAMIN F. JOHN COMPANY

1003 RACE STREET

Furnace and Range Work Sheet

PLEASE READ THIS SHEET

Order No. ..... PHILADELPHIA, ...

For Mr. .....

For Work at .....

TOTAL MATERIALS USED

Castings		Firebrick	
		Cement	
		Rivets	
		Mortar	
Smoke Pipe		Wire	
Heat Pipe	Tin Elbows	Nails	
Castings and Galv. Sheets		Bolts	
Black Sheets		Asbestos	

Please charge time below, day by day. Workmen handed this sheet will be held responsible for its correctness.

Date																		TOTAL		
WORKMEN																		OUTSIDE	SHOP	CAR FARE

taken into the confidence of the "boss" and this loss explained most men will exercise greater care, to the advantage of the shop. At least such has been the experience of those who have tried it out and have continued to check up once in a while.

A glance at the various headings of material on sheets Nos. 3 and 4 will show the numerous small items that are easily forgotten, and while these sheets are for a certain shop, this same sheet can be used by any shop and other items inserted as suits each shop. The purpose of printing the items on both the WORK SHEET and ESTIMATE BLANK is to call them to the mind of the person who is making out the bill or estimate. If the mind of the person sees the job, his experience will show that the job could not have been finished without certain material, if it is missing on the work sheet. The back of these sheets may be used for an explanation of the job or other memorandum concerning its execution. These JOB SHEETS if placed in a hard back binder by date or number can be made a fine reference, and so can the estimate sheets, even when the job has been lost.

◆ ◆ ◆

This is the same kind of a sheet as Fig. 3, but is for furnace work. Not as many items need be itemized, but just as careful a check should be made. Both of these sheets serve to keep the workmen from leaving ladders, tools and material on the job to be found months later

◆ ◆ ◆

Checking of material and labor so closely was not thought so important in the old days, but now when every cost item must be figured to make a profit, due to the low profit now being asked, these sheets will be found to give real service at small cost.

These sheets have been developed by necessity and many shops have contributed their sheets at various times for the general good, and from them it seems to be the opinion in the profitable shops that the names of the material printed on either front or back, does give the mechanic charging the material used a little persuasion of the right kind.

◆ ◆ ◆

This is the back of the furnace sheet showing additional items of materials commonly used. These sheets should all be different colors, and can be filed together after the job is finished. They make a ready reference for checking back on a job or estimating on another

◆ ◆ ◆

Registers	Slate Borders
Flue Dampers and Knobs	
Metal Lath	
Plaster	
Damper Clips	
Screws	Muslin
Safety Thimbles	Paste
Brick	Sand

More Solutions for That February 16 Fan Problem

IN the February 16 issue we presented a heating problem in which the contractor experienced difficulty in making the plant function properly. Most of the trouble seemed to be in the ability of the fan to force air through the system. Most of you probably remember the layout, but for convenience we show again the system as now laid out.

In the March 30 issue we published some replies offering suggestions for changes. Now we are ready to show some additional solutions, these accompanied by diagrams showing the changes suggested by the writers.

First off, let us give the suggestions offered by Platte Overton. Here is what he says:

"Your problem regarding the unsatisfactory performance of the above installation may be traced directly to the fan.

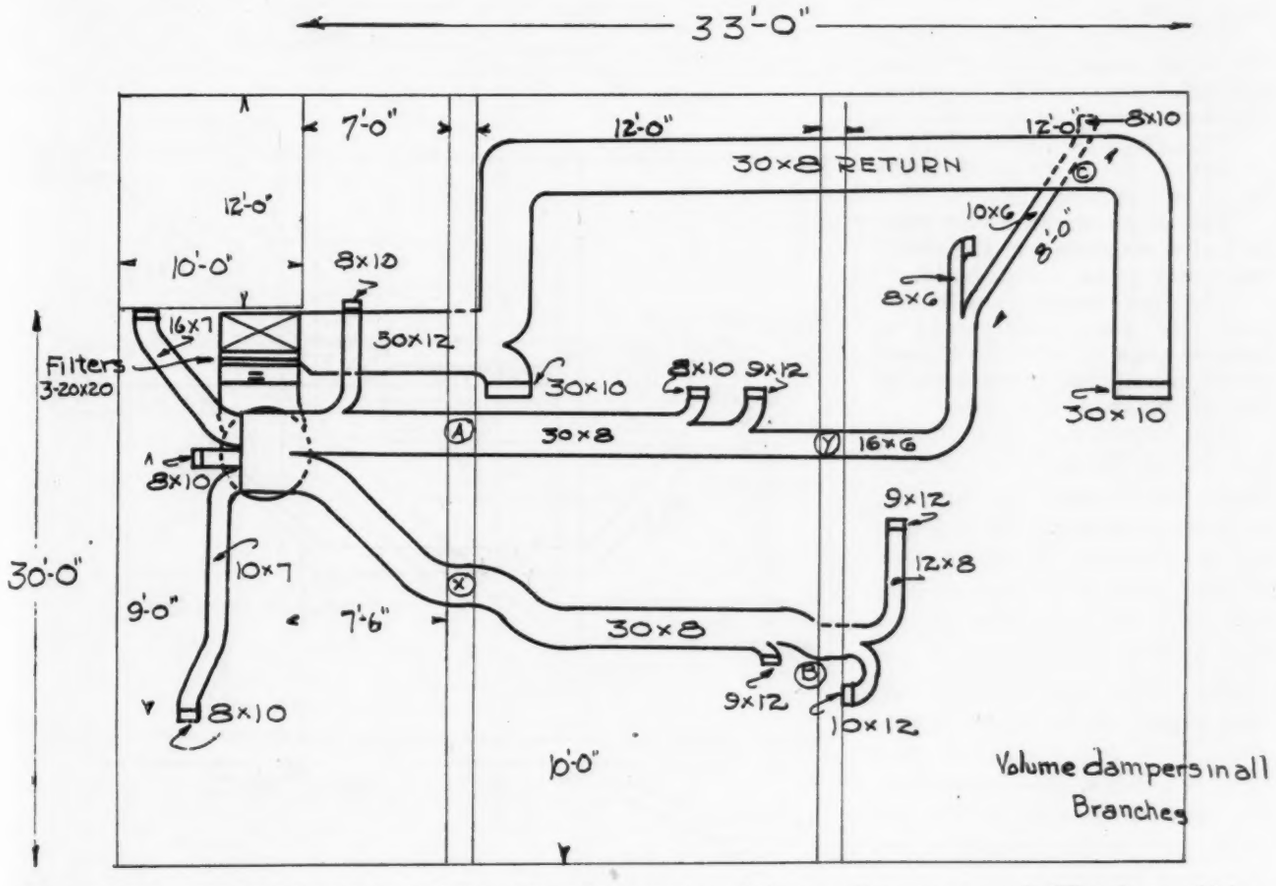
"In general, the piping system is not bad, and while a few technical errors are obvious, the fact remains that with the proper fan and with the air filters cleaned the necessary air should be delivered at the warm air inlets.

"You state that 1600 C.F.M. is required for this house. As we will assume that this 1600 is the delivered C.F.M., say, at 110 deg., the return air should be 65 deg. or .069 (density of air at 65 deg.) divided by .075 (air at 110 deg.) equals .92 approximately; 1600 times .92 equals 1470 C.F.M. in return ducts. The return duct is 30x8 in. and 45 ft. long to which we add 20 ft. for each elbow as they are shown with 90 deg. turns and short throats, and this gives us a total length of 145 ft. of duct 30x8 to carry 735 C.F.M. (only half the return air in long duct).

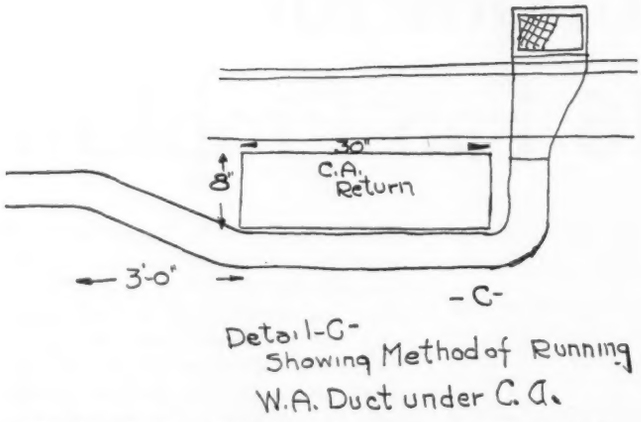
"One 30x8 duct is equivalent to one 16-in. round duct for equal friction and our chart gives us .033 friction per 100 ft. for a 16-in. duct with 735 C.F.M. .033 × 145 equals .0478 in. of water for our return.

"On the supply side we find the longest duct 10x6 at point 'C' and we assume that the duct in general is designed to equal friction per lineal foot. For this duct we have 36 ft. of length and 5 elbows of a total length of 136 ft.

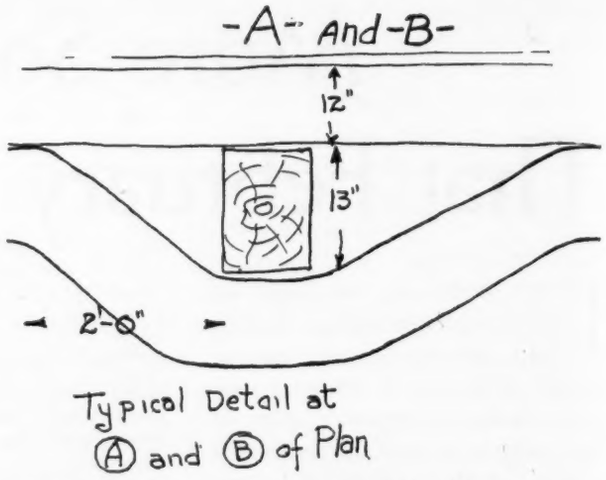
"A 10x6 duct is equivalent to a



The system is comparatively simple in design. Three large trunks and three smaller ones are used. What do you think is holding up the air flow?



This is a detail of the return air and warm air ducts at C. The contractor is somewhat doubtful of his frictional resistance here. What do you think?



At A and B the warm air ducts had to be dropped under one of the supporting beams of the house. Do you feel that this construction impairs air flow here?

round duct 8.4 in. in diameter and we will assume that this duct should carry 200 C.F.M.

"Again referring to our resistance chart we find that 8.4-in. round duct with 200 C.F.M. will have a resistance of .06 in. of water per 100 ft. or .081 in. for 135 ft.

"No available data for the resistance over the heater is obtainable but we will assume a minimum of .04 in.

"The air filters will carry from 0.10 when clean up to 0.25 when dust filled and we will give these filters an average of 0.12 in.

"This gives us a total of .0478 + .081 + .04 + .12 equals .2888 or 0.3 in. approximately.

"This is, of course, a very conservative estimate and the resistance may go as high as ½ in.

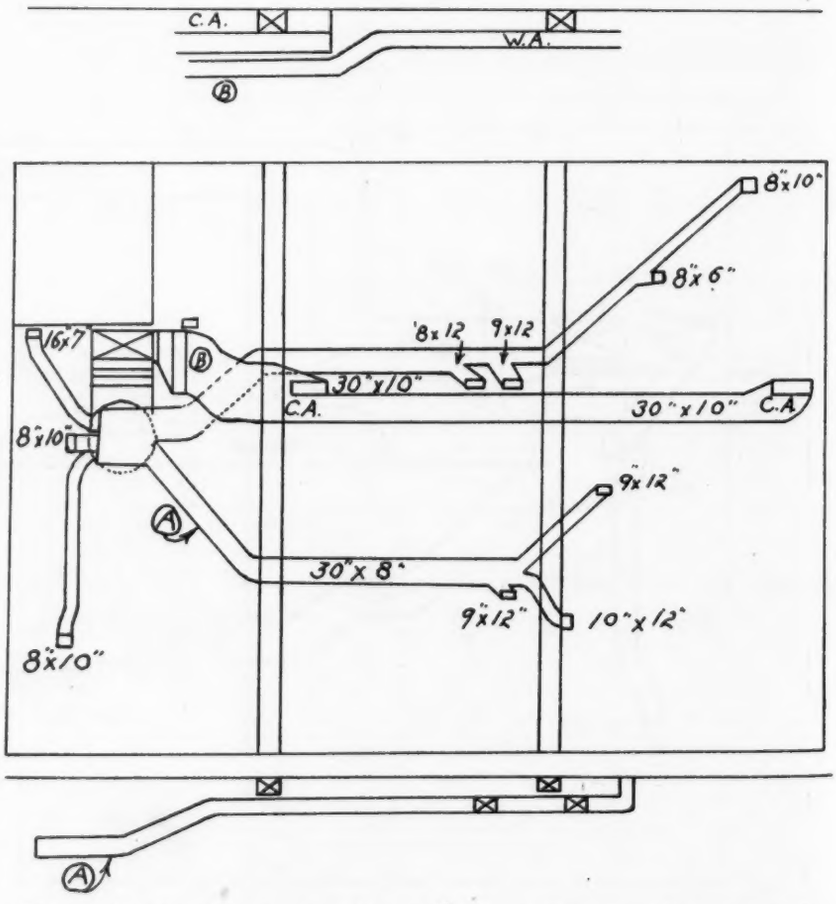
"The fan installed will not meet the requirements and a squirrel cage or pressure blower would be required to successfully deliver the required C.F.M."

Then here is a solution offered by Victor Horacek of Allston, Mass. Mr. Horacek also supplies a drawing showing the changes he recommends. Look at this drawing and see how the present system is changed. Most important is the re-arrangement of the return air duct and the warm air duct supplying the registers farthest from the heater. It was here, remember, that some trouble was anticipated when the warm air duct was dropped under the return air duct.

Mr. Horacek does away with this situation by swinging his warm air trunk toward the outside wall and taking branches from one trunk. The return air trunk is moved over to the center line of the basement to make a straight run to the heater. Other trunks remain as at present.

Mr. Horacek says: "I feel that there is plenty of resistance in the present system. To overcome this resistance two trunks are changed so that straight, flat runs replace the present layout."

B. L. Schwartz, whose excellent jobs have been reported from time to time in AMERICAN ARTISAN, submits two drawings showing



This is the altered system as laid out by Victor Horacek. The warm and return air trunks are switched to get straighter and more uniformly level runs

the alterations he would make in the system. His changes, like Mr. Horacek's, reverse the long warm and return air trunks. Mr. Schwartz has these comments to make:

"The writer noted with interest the trouble job reported on page 42 of the February 16, 1931, issue of the AMERICAN ARTISAN. In view of the fact that I went through a similar experience a number of years ago, although this was with a gravity job only, I am pleased to outline below our thoughts in connection with the correction of this difficulty.

"The primary trouble lies in the fact that the warm air lines have to drop down from 8 in. to 13 in., and then return to their former level. Another source of trouble lies in the fact that the short cold air return undoubtedly functions to the disadvantage of the long cold air return from the front of the house.

"We believe that this job can be fixed up without a great deal of expense, although it will necessitate the complete revamping of the cold air system. We have indicated on the sketch attached hereto how this should be done. The 30x8 cold air return at the location marked 'c,' should be reversed and run between the two 30x8 warm air ducts at the same level. Judging from the partition walls, the direction of the joists are such that the warm air connections marked 9x12 and 10x 12 could be made over top of the beam, instead of under the beam as shown in detail 'a' and 'b.'

"In order to prevent a down dip of the main trunks at 'a' and 'x,' these should be taken off at a lower level than shown in detail 'a' and 'b.' This arrangement is illustrated on the sketch we are attaching. The connection at the point marked 'y' can easily be run over to the corresponding joists where the outlets terminate in registers, and in this way run through the joists over top of the beam.

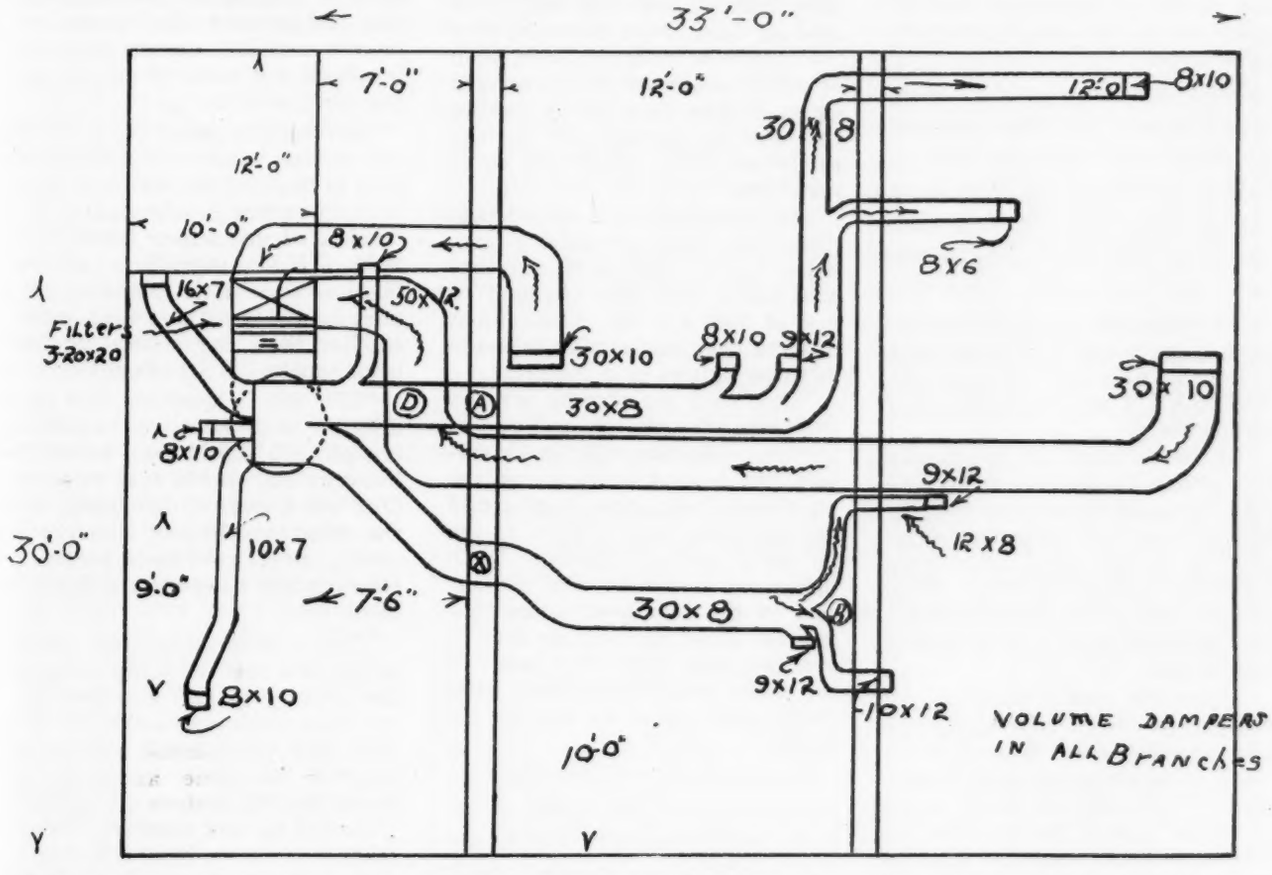
"We are also indicating a change in the near cold air return. We have purposely introduced some additional right-angle bends in order to make the frictional resistance to the flow of air approximately that coming from the front of the house. In this way the far cold air return will function with consequent better heating results."

G. A. Voorhees, who has been traveling around the country pretty steadily of late, replies that he would like to devote enough time to this problem to make a thorough study, but such is not possible and all he can do is point out a few of the obvious faults. He says:

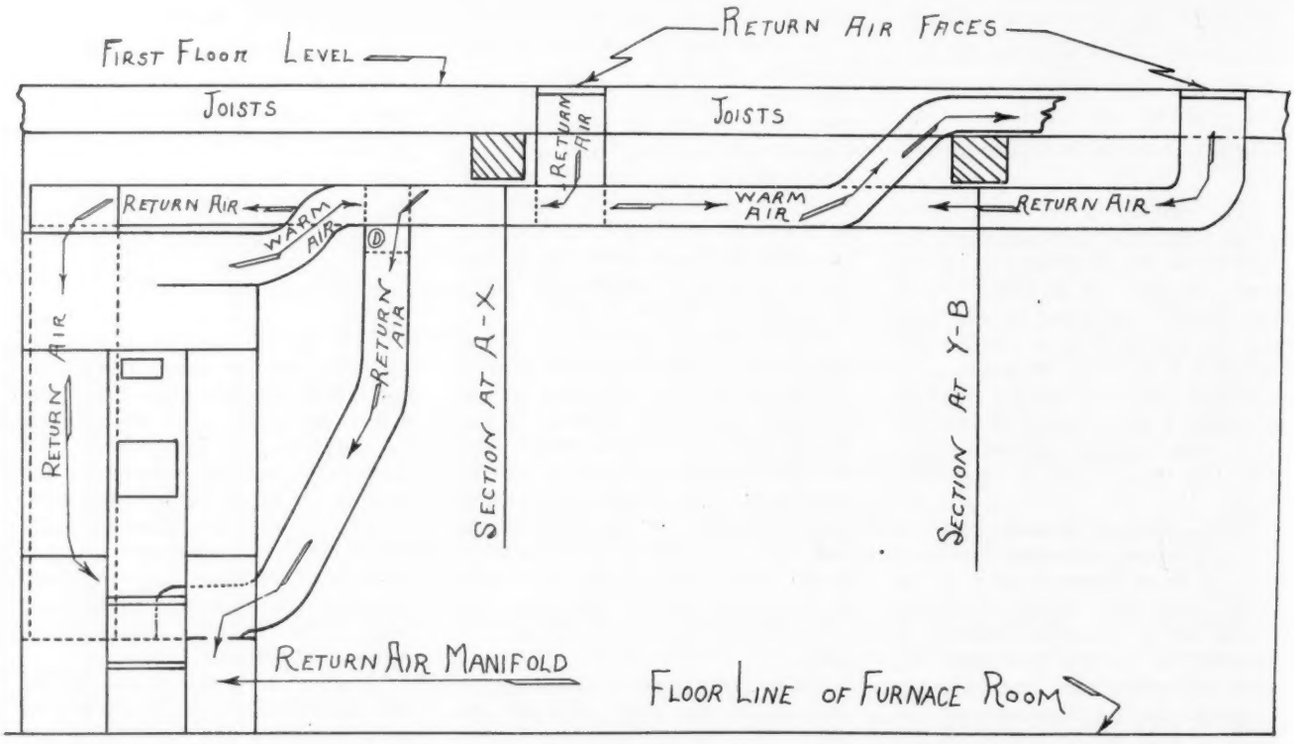
"The piping system is unusually long for the size of the building. Add to this, the fact that filters are used, and we have a job requiring a fan which will move the desired volume of air against an appreciable resistance.

"The chances are that the manufacturer of this fan had rated it according to free delivery performance; or if it was rated on a static pressure basis, such ratings were not carefully made.

"Unless a heating contractor has had sufficient experience with fans to enable him to choose the particular type and size of fan unit best suited to a given job, he had better submit a plan of the installation to a fan manufacturer and insist that the manufacturer supply a fan guaranteed to fit the job.



B. F. Schwartz submits this altered layout which he states will eliminate the objectionable traps and give a better distribution of heat off the furnace



The elevation of Mr. Schwartz's plan shows the warm and return air trunks running at the same level. The warm air is stepped over the cross beams rather than under them

"In the absence of a manufacturer's guarantee, the inexperienced heating contractor will be playing safe on such jobs as this one, to use a centrifugal fan instead of the less expensive propeller type."

One very interesting letter comes from J. E. Washburn of the Washburn Heating Service, Lakewood, Ohio. Mr. Washburn does not submit a sketch, but his comments illustrate his points well. He says:

"In reference to the unsuccessful fan job as described on page 42 of the February issue of the ARTISAN, I wish to make a few comments.

"If the installer was practically new at the fan game on trunk line jobs, it would have been well for him to have first gotten an engineering layout and other help from the fan manufacturer. They usually maintain a department for this purpose and it is generally free of cost.

"From the sketch which is too meager to completely figure the heat requirements, it seems that there is entirely too much resistance to the flow of air to use a propeller type of fan for this job. It should have been the squirrel cage pressure type of blower. If this job was designed for both forced and gravity circulation, the blower should have been of the louvre type.

"There is a total of 802 sq. in. heat delivery and only 600 in. of cold air duct. Since there are only two 10x30-in. cold air faces, each of which could not have over 243 sq. in. of free air opening making the total air opening 486 in., it is easily seen that the return air is restricted.

"In the article it is stated that there was first installed a propeller fan of 7000 C.F.M. and that afterwards this was changed to one of 3000 C.F.M. There must to have been some mistake made in these figures or a misprint.

"Two cold air returns are not sufficient for this job and one of the ducts has two right angle offsets and is very long. I can see no reason why this duct could not have been run straight to the far away cold air opening. With the proper fan or blower, the offsets in the two heat ducts that depress under the cold air duct is one case and under the beam in the other would have very little detrimental affect on the air delivery."

Our good friend Benjamin F. John sends a letter which is replete with recommendations and cites conclusions reached from his many years in the heating business. Here is his letter:

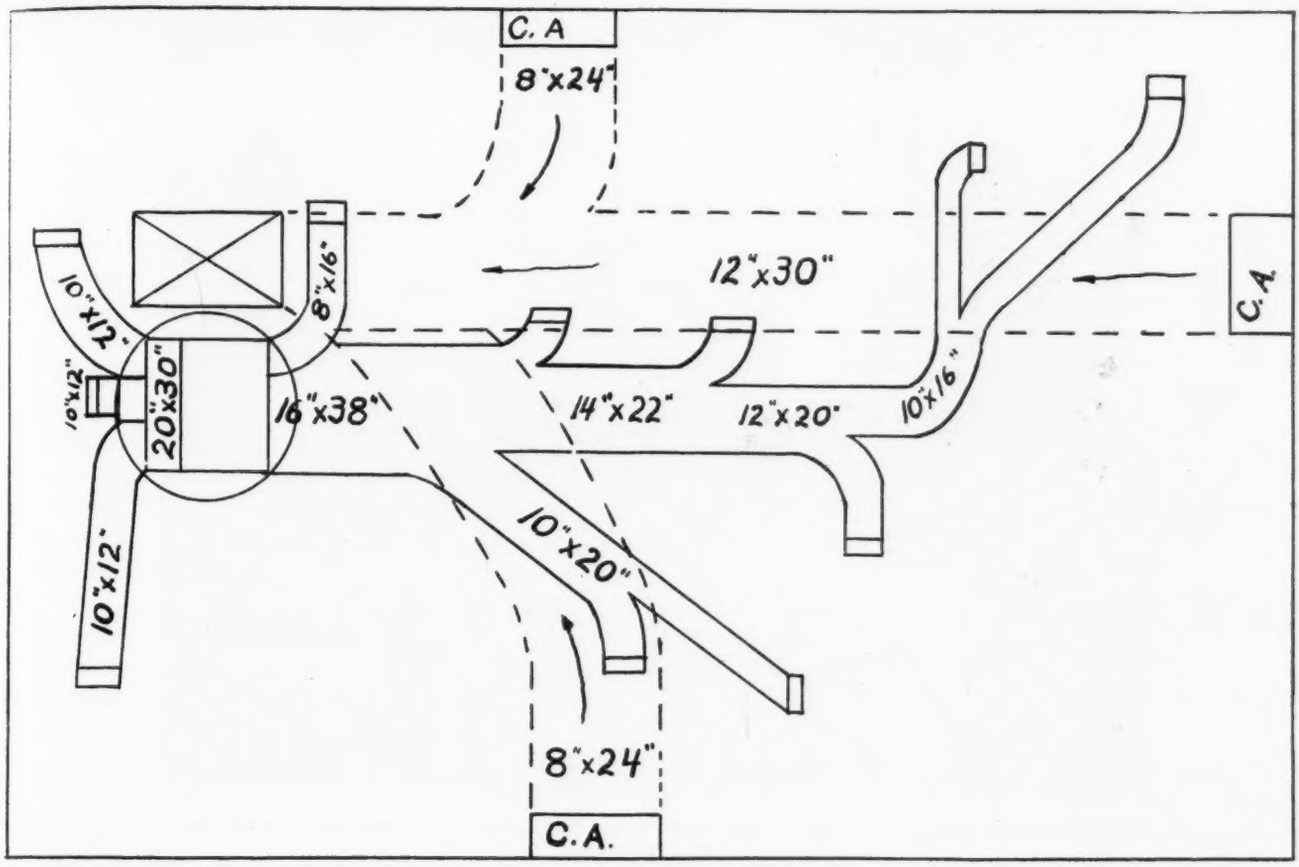
"This plan indicates a trouble that the warm air contractor will tumble into when he imagines that just because a fan is attached to the heating system, he can break all the rules of nature and get away with it.

"Several like jobs have come to my notice where the matter of area in heat trunks seems to have been forgotten just because a fan is claimed to deliver 1600-3000-5000 C.F.M. regardless of the friction and static pressure created by a length and area much smaller than the contractor has been taught by Standard Code.

"The job in question has two 8-in. by 30-in. heat trunks with a fan of 3000 C.F.M. and probably between 300 to 400 feet velocity. One trunk over 40 feet long, and the other over 30 feet, which indicate almost a ½-inch pressure. Nothing but a blower could overcome this.

"The type of installation seems to indicate that the jump between the gravity system and fan system has come too suddenly and that such jobs should always be referred to some authority on forced heating before taking such a chance as this man and others take.

"Regardless of the advice of some large heating contractors



This plan is suggested by Lee Deeter of Hannibal, Missouri. Its feature is shorter runs of warm and return air. Both ducts run along the bottom of the floor joists

and engineers, the general run of contractors will find themselves in pocket if they do not stray very far away from the gravity size heat piping sizes until they become accustomed to the smaller sizes, and learn a good deal more about fans in actual service.

"One rule we always follow is to make the heat trunks in a low velocity job slightly less in height than one-half the width, and never make them less than 8 inches in the fingers, when the trunk exceeds 25 feet. And another rule we observe is to make the collar on the furnace bonnet larger than the size of the trunk and taper to the trunk at the first turn, or make a special bonnet and cover the entire surface of the heating casings with cone type starters for each trunk from 15 to 20 per cent larger than each trunk, even if the bonnet extends over the casings rings.

"Fourteen sweet jobs installed by one of the largest heating concerns in the country last summer will all be revamped this coming summer due to small pipe areas—some as small as 4 in. by 6 in. for a room of 118 sq. in. Who forgot how much the static pressure increases as the square of the pipe decreases, even in spite of a blower?"

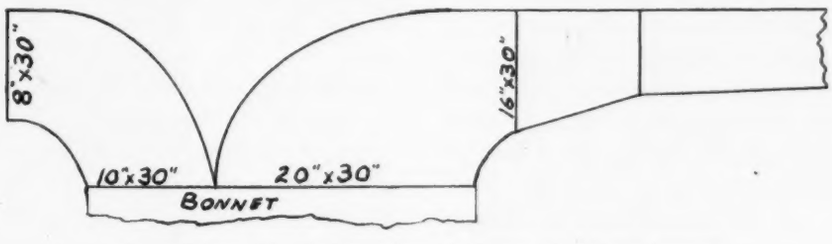
The last letter we have space for is from Lee Deeter of Hannibal, Missouri. Mr. Deeter also encloses a sketch showing a rearranged plan and a cross section sketch showing how he would take his ducts off the top of the heater casing. Here are his comments:

"This problem would have been much simpler if a floor plan had been published. Also it does not show how the furnace faces, which would have helped some.

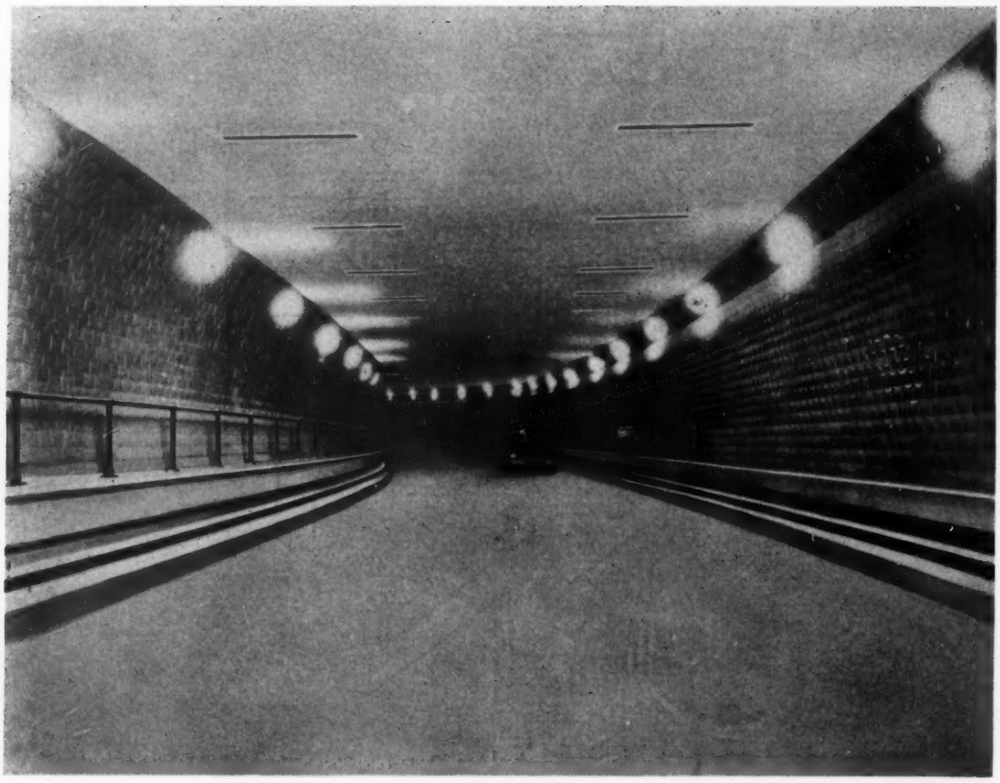
"One thing certain is that the present system has too many 90 degree elbows in the return air ducts and also in the warm air trunks.

"I certainly would not drop my warm air duct below the return air duct. Such an arrangement makes a trap which is difficult to get air through. If possible I would change the location of the return air grilles so that the duct could be placed between the joists as I have indicated. Then the warm air ducts can be run along the bottom of the floor joists and kept level.

"Of course my register and grille locations can be shifted to fit the floor plan, but if the contractor will stay as close to my plan as possible the revamped system should work satisfactorily."



Here is how Mr. Deeter takes his warm air off the bonnet



Fresh air is introduced through the apertures along the curbs and is taken out through the slots in the ceiling

The Ventilation System of The Detroit-Windsor Tunnel

By **RAY S. WOOD**
Link-Belt Company, Detroit, Mich.

Midnight, November 2, 1930, the first international sub-aqueous tunnel in the world, located under the Detroit River, connecting Detroit, Michigan, and Windsor, Ontario, was officially opened to traffic.

Sixty years of promotion are behind the Detroit and Canada Tunnel. Sixty years ago, the citizens of Detroit were much wrought up over a mighty debate which was then raging about the relative merits of a bridge and tunnel at this point. The railroads favored a bridge. Shipping interests, however, insisted that such a structure would constitute a hazard to navigation, and as such, should be prohibited. The exceedingly high masts of the sailing vessels then plying the Detroit River aggravated a problem. A bridge built high enough to clear these masts, it was found, would require approaches a mile long at each end to keep the grade down to the limited hill climbing ability of the locomotive. Attention, accordingly, was directed to the tunnel project for swift transportation across the river. Ever since that time the tunnel idea has been argued pro and con.

In 1871, ground was broken near the foot of St. Antoine Street for a tunnel under the Detroit River. A pocket of sulphurous gas entered the project when workmen were 125 feet out under the river. The gas made the men so sick that none of them could be induced to resume work on the following day, and the project accordingly was abandoned.

Detroit's second tunnel venture took place in 1871 when a tube was projected to connect Grosse Isle, an island in the Detroit River, with the Canadian mainland. No gas was encountered here, yet this undertaking, too, had to be abandoned.

The Detroit and Canada tunnel is approximately one mile long long from portal to portal. The American portal is but a few hundred feet from the center of the financial and shopping center of Detroit, while the Canadian end is located in the very heart of Windsor's rapidly expanding business center. The roadway in the tunnel

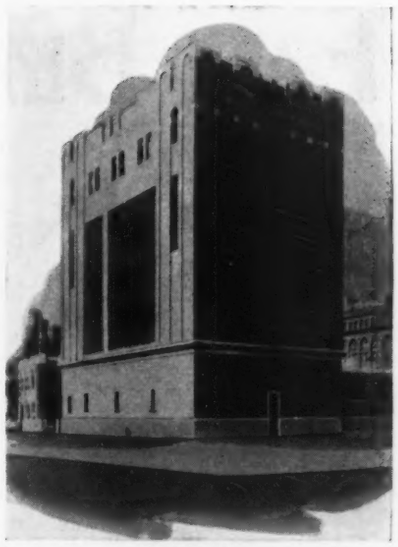
is 22 feet wide, allowing one lane of traffic in each direction, and an extra lane to spare. This permits of the removal, both quickly and safely, of disabled automobiles. Traffic will be so regulated that despite the fairly high rate of speed, driving in the tunnel will be safer than surface driving in the surrounding streets. The estimated capacity is 1000 vehicles an hour in each direction.

One of the most elaborate ventilation systems ever devised has been installed in the Detroit and Canada Tunnel, with the result that air in the tunnel is purer than the air in the street outside.

Two ventilation towers have been constructed in connection with the tunnel project, one at each end. Each building is approximately 100 feet high, on a site 50 feet by 90 feet. Each structure with its equipment, provides ventilation for half of the subway. Equipment consists of B. F. Sturtevant fresh air fans and exhaust fans, motor driven through Link-Belt Silent Chain drives. The fans are arranged in successive tiers in different stories, with direct connections to the subway ducts. Each fan is 12 feet in diameter and there are 12 of them in each building—six blower fans to draw in fresh air and six exhaust fans to expel used air and automobile gases.

The total amount of fresh air that can be supplied to the ducts of the tunnel, is approximately 1,500,000 cubic feet per minute, which gives a complete change of air throughout the tunnel every 90 seconds. Fresh air comes into the tunnel under the roadway as you will note from the cross section drawing, escaping through the curved apertures near the curb line. Used or vitiated air is drawn off through two rows of openings located at frequent intervals in the ceiling of the tunnel.

Fresh air is drawn into the ventilating tower through gill-like apertures on three sides of each vertilation building. These gills consist of glass louvres, each louvre being two feet long by eight inches wide. There are 3,000 of them in each building. Glass is used because it is easily replaced and it admits light as well as air into the interior of the building.

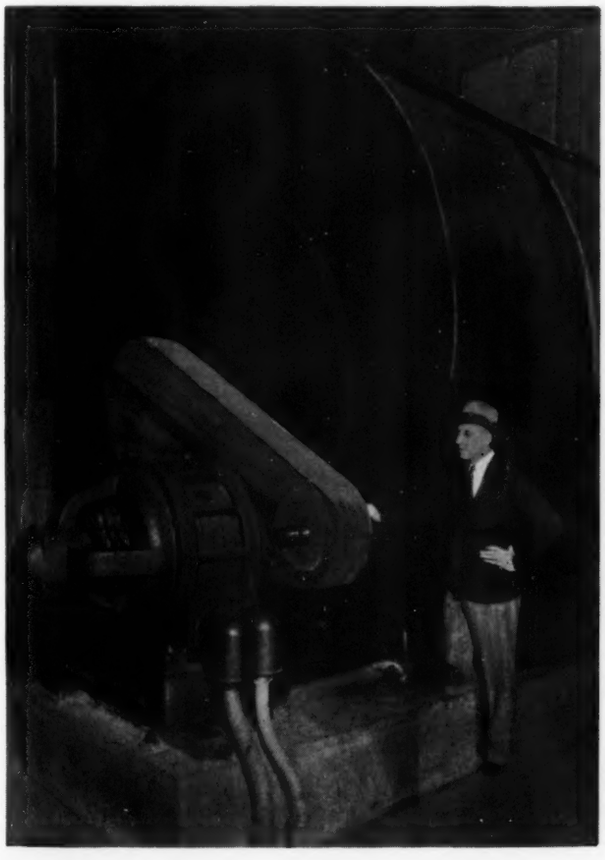


One of the ventilating towers. The grilles are glass to admit both light and air

While fresh air is drawn into the ventilation building through apertures between the many louvres, vitiated air is expelled through exhausts located at the top of each building.

This ventilating system is patterned after that which has proved so phenomenally successful in the Holland Tunnel in New York. Before the Holland Tunnel, the first of its kind in the United States, was built, it was necessary to do a great deal of research in order that there might be no danger from the millions of automobiles using this great traffic artery between New York City and the Jersey shore. Safeguards against gases given off by a burning automobile also had to be considered. Exhaustive studies accordingly were made by New York engineers aided by the United States Bureau of Mines and laboratory departments of leading American universities. On the basis of this test, it was established that human beings subjected to motor exhaust gases, deluded to a concentration of four parts of carbonmonoxide to 10,000 parts of fresh air, for periods not exceeding one hour, suffer no harmful effect. This concentration of four parts of car-

(Continued on page 38)



The exhaust and fresh air systems are separate systems and each has its own set of Sturtevant fans. These fans are 12 feet in diameter and are connected to the motors by Link-Belt chains. There are 12 fresh air fans capable of supplying 1,500,000 cubic feet of air per minute

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Heating Engineer

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Item 2 is the length times width times the ceiling height.

Item 3 is length times the width.

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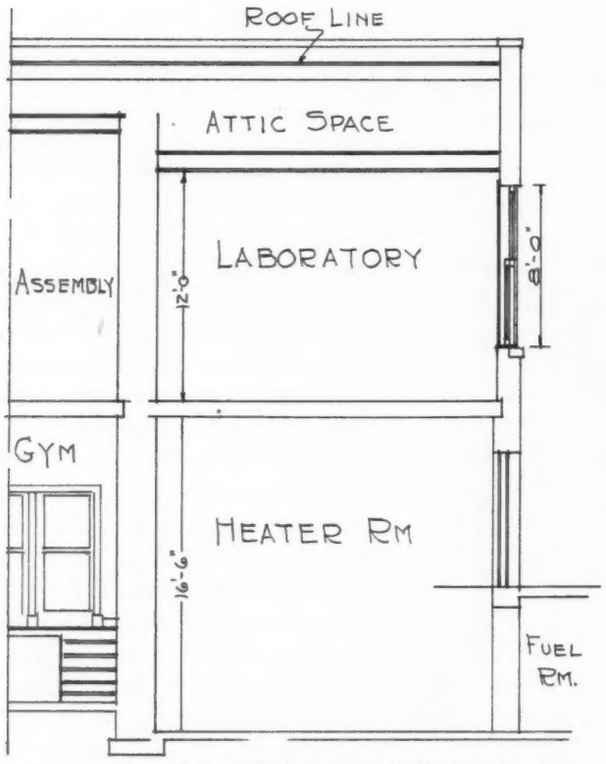
As stated in the February 16 issue, the factor by which we multiply the exposed surface to find the B.t.u. loss is obtained by multiplying the constant by the temperature rise.

The temperature rise will vary with the ceiling heighth. The higher the ceiling the higher the temperature rise. As the ceiling heighths vary throughout our building, we refer to the graph for mean or average temperatures for rooms with ceilings over 10 or 12 feet in height.

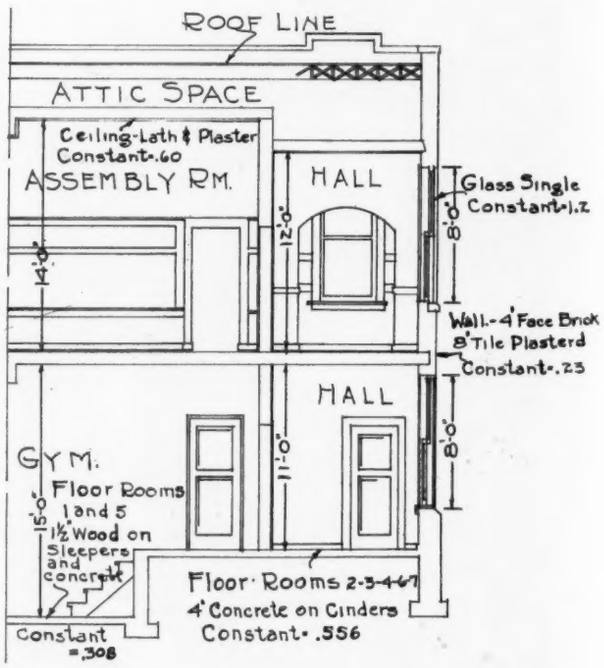
Hence, in the gymnasium with a ceiling heighth of 15 feet our temperature rise would be 20 degrees to 76 or 96 degrees.

It will be noted that there is no ceiling loss for the first floor, or any flow loss for the second floor. Where floor losses occur only the floor area within 10 feet of the outside wall is considered.

The reader will also note that the air supply inlet temperature (item 27) varies. Our air supply (item 25) is fixed by state law. We must supply 2 cubic feet per minute for every square foot of area in class rooms, and other rooms such as 105-105-6-7 may be supplied with enough air to ocset the B.t.u. loss. In this case we divide the B.t.u. loss (item 22) by the factor 48.96.



Cross section of the building through the heater room and laboratory. Ceiling heights and window heights for calculations are shown



On this cross section the constants of heat loss for the structural parts are indicated. These constants multiplied by areas give the heat losses for various rooms or walls

File No.

Based on -20 °F. Cold Weather & Prevailing Winds From

Bldg. Date

Dist. No.

or Loc. Typ. Co.

Bldg. H. & V.

Archt. Engr.

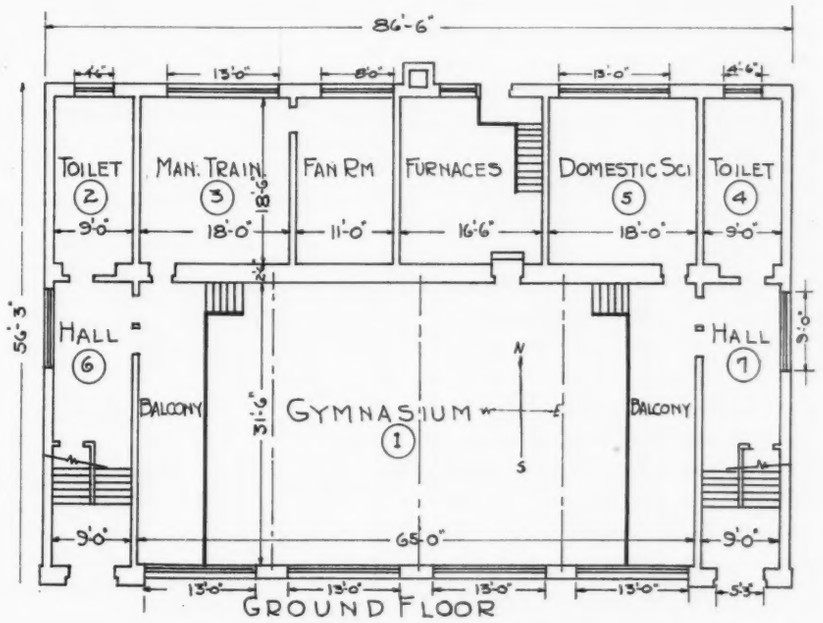
Exposure Factors: N 35 %, NW 30 %, NE 25 %, W 25 %, E 20 %, SW 15 %, SE 10 %, S 0 %

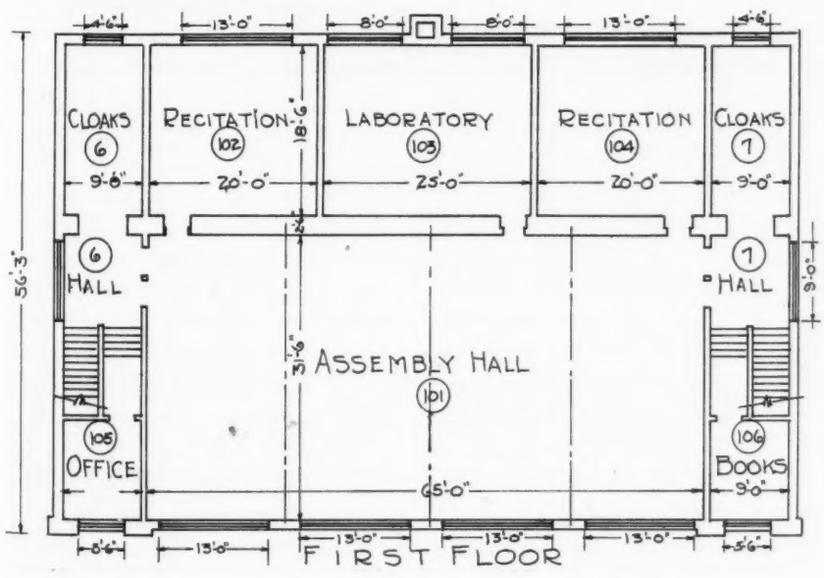
Room No.	1	2	3	4	5	6	7	101	102	103	104	105	106	TOTALS
Use	Gym	Toilet	M.Train	Toilet	Dom.Sc	Corr	Corr.	Assem	Recl.	Labor.	Recl	Office	Books	
MEASUREMENTS														
1. Room Dimensions	65x31'6"	9'x20'	18'x18'6"	9'x20'	18'x18'6"	9'x52'6"	9'x52'6"	65x31'6"	20'x18'6"	25'x18'6"	20'x18'6"	9'x11'	9'x11'	
2. Cubic Foot Space	25104	1980	3663	1980	3663	7935	7935	28658	4440	5556	4440	792	792	
3. Room Floor Area	2048	180	333	180	333	473	473	2041	370	463	370	99	99	
4. Floor Const. & Factor	31-153	56-274	56-274	56-274	31-124	56-20	56-20							
5. Ceiling Const. & Factor						60-21	60-21	60-27	60-24	60-24	60-24	60-24	60-24	
6. Window Const. & Factor	12-115	12-108	12-108	12-108	12-108	12-102	12-102	12-114	12-108	12-108	12-108	12-108	12-108	
7. Wall Const. & Factor	23-21	23-21	23-21	23-21	23-21	23-21	23-11.5	23-21.3	23-21	23-21	23-21	23-21	23-21	
8. Exposed Sash and Door Perimeter, equiv.	22	28	84	28	84	133	133	212	84	112	84	30	30	
9. Leakage B. T. U. per ft. of Perimeter	120	120	140	120	120	120	120	120	120	120	120	120	120	
10. Expd. Wall Gross Area	911	319	198	319	198	1118	1118	910	2220	2664	2220	160	160	
11. Expd. Window Gross Area	416	32	104	32	104	203	203	416	104	104	104	25	25	
12. Expd. Wall Net Area	495	287	94	287	94	903	903	494	136	136	136	135	135	
13. Exposure Direction	S.	N.W.	W.	N.E.	W.	E.	E.	S.	N.	N.	N.	S.W.	S.E.	
14. Room Temperature	70°	70°	70°	70°	70°	65°	65°	70°	70°	70°	70°	70°	70°	
HEAT LOSSES														
15. Wall Loss B. t. u. per Hr.	10890	6027	1974	6027	1974	15907	15907	10569	2856	2856	2856	2835	2835	
16. Window Loss B. t. u. per Hr.	47973	3465	11232	3465	11232	21318	21318	47424	11232	13824	11232	600	600	
17. Subtotal Loss B. t. u. per Hr.	58813	9492	13206	9492	13206	37225	37225	57993	14088	16680	14088	3435	3435	
18. Expos. Allow. B. t. u. per Hr.	44820	7247	2473	2315	4627	9306	7423	2899	4931	3834	4931	315	343	
19. Floor Loss B. t. u. per Hr.	9945	4032	4032	4032	2232	5760	5760							
20. Ceiling Loss B. t. u. per Hr.						9939	9939	55269	8880	11112	8880	2376	2376	
21. Leakage Loss B. t. u. per Hr.	37620	3360	10080	3360	10080	19080	19080	32640	10080	13440	10080	3600	3600	
22. Total Heat Loss	104378	19131	31940	19251	30140	85004	83145	148801	27919	41066	37919	9926	9754	
23. Deduct for Heater Size	16370	1680	5040	1680	5040	9540	9540	16370	5040	6720	5040	1800	1800	
24. Heater Building-loss Load	88018	18051	26900	17571	25100	75464	73605	132431	22939	40346	32939	8126	7954	
SERVICE														
25. Air Supply C. F. M.	4086	424	666	418	666	1683	1683	4094	740	1029	740	205	205	
26. Recirculation C. F. M.														
27. Air Supply Inlet Temp.	93.8	120°	120°	120°	112°	120°	120°	103.2	120°	120°	120°	120°	120°	
28. Air Supply B. t. u. Service														
29. Direct Rads. B. t. u. Service														
30. Direct Rads. sq. ft.														
31. Grav. Ind. Rads. sq. ft.														
32. Aspir. Coils Rads. sq. ft.														

Above is shown the data sheet completely filled in for this building Every item of heat loss is accounted for. The filled-in sheet is a detailed picture of the heating requirements

It will be seen that for this particular plan the inlet temperature do not vary much from 120 degrees.

The reader should save this copy of the AMERICAN ARTISAN, as we are going to design a complete system of fan blast warm air heating and ventilating for the included plan, and many references will be made to the data sheet and to these preliminary plans.





Above—Plan of the ground floor showing room numbers which are duplicated on the data sheet

Left—Plan of the first floor. These plans can be taken off the architect's drawings, if a new building, or drawn out in scale on replacement work

The central wall, 2 feet and 6 inches wide, will be used for supply and exhaust flues, and care must be taken not to place these flues where the beams that carry the Gym and Assembly Hall ceilings will rest.

In the next issue we will discuss the size of fan, heaters and motor.

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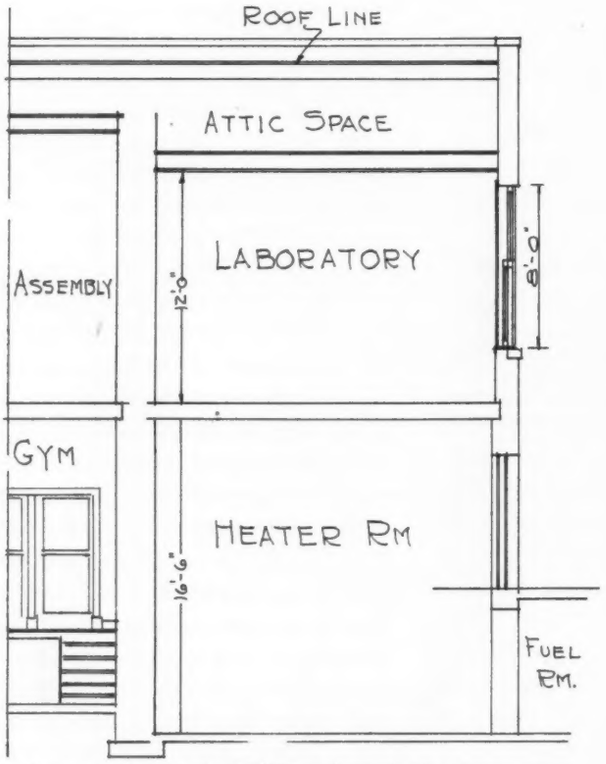

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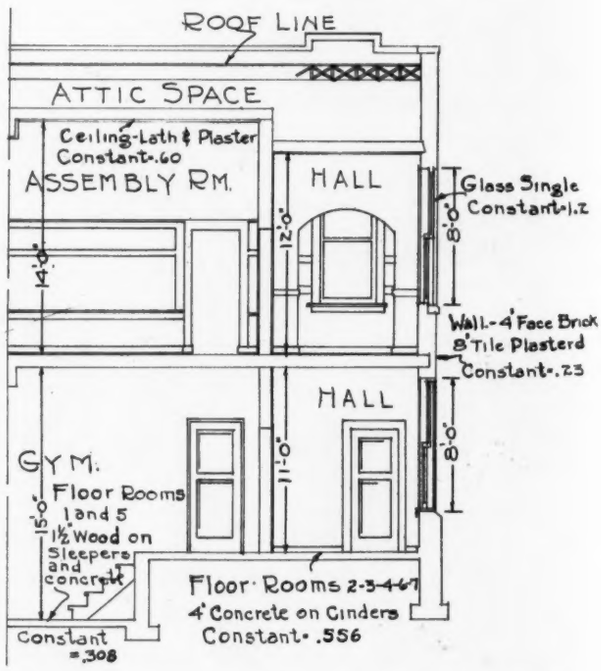

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Room No.	1	2	3	4	5	6	7	101	102	103	104	105	106	TOTALS
Use	Gym	Toilet	M. Train	Toilet	Dom. Sc	Corr	Corr.	Assem	Recl.	Labor.	Recl.	Office	Books	
MEASUREMENTS														
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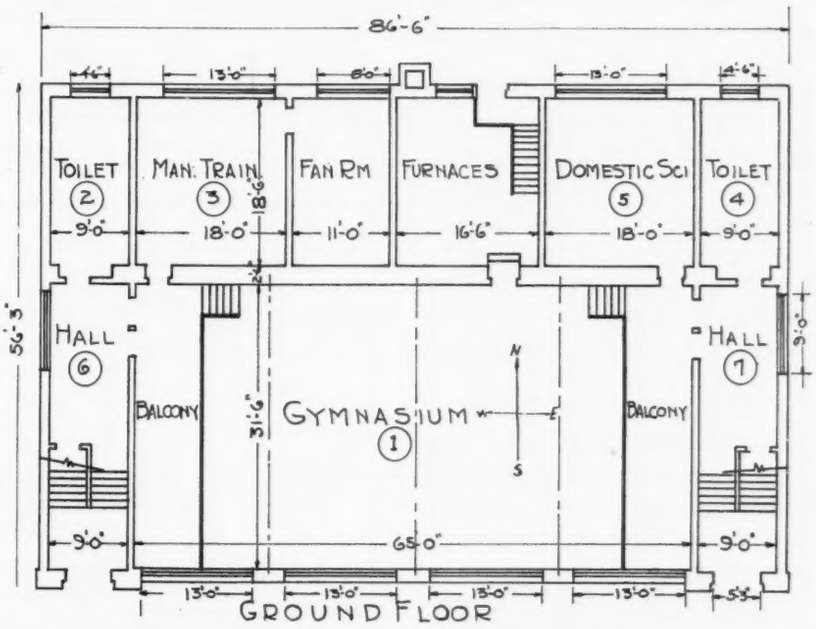
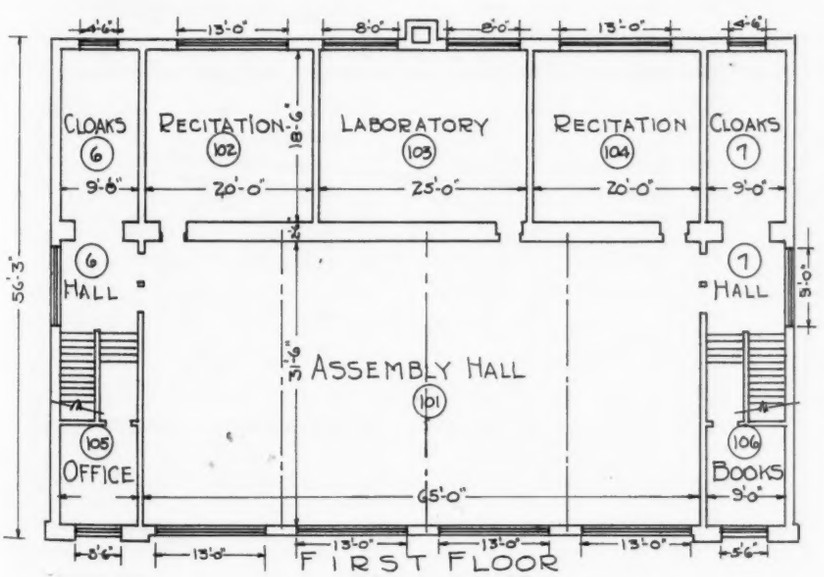
4. Floor Const. & Factor	31-153	56-22.4	56-22.4	56-22.4	31-12.4	56-20	56-20							
5. Ceiling Const. & Factor						60-21	60-21	60-27	60-24	60-24	60-24	60-24	60-24	
6. Window Const. & Factor	12-115.2	12-108	12-108	12-108	12-108	12-102	12-102	12-114	12-108	12-108	12-108	12-108	12-108	
7. Wall Const. & Factor	25-21	25-21	25-21	25-21	25-21	25-21.3	25-21.3	25-21.3	25-21	25-21	25-21	25-21	25-21	
8. Exposed Sash and Door Perimeter, equiv.	720	120	192	120	192	185	185	276	128	172	128	40	40	
9. Leakage B. T. U. per ft. of Perimeter	120	120	120	120	120	120	120	120	120	120	120	120	120	
10. Expd. Wall Gross Area	911	319	198	319	198	1118	1118	910	240	264	240	160	160	
11. Expd. Window Gross Area	216	36	108	36	108	203	203	216	104	144	104	45	45	
12. Expd. Wall Net Area	495	283	54	283	54	905	905	494	136	120	136	115	115	
13. Exposure Direction	E	NW	N	NW	N	W	E	S	N	N	N	SW	SE	
14. Room Temperature	70°	70°	70°	70°	70°	65°	65°	70°	70°	70°	70°	70°	70°	
HEAT LOSSES														
15. Wall Loss B. t. u. per Hr.	10890	6027	1974	6027	1974	15907	15907	10569	2856	2856	2856	2835	2835	
16. Window Loss B. t. u. per Hr.	21374	2469	11232	2469	11232	21318	21318	41474	11232	13824	11232	600	600	
17. Subtotal Loss B. t. u. per Hr.	32813	9432	13206	9432	13206	37225	37225	52043	14088	16680	14088	3435	3435	
18. Expos. Allow. B. t. u. per Hr.	2190	2849	2849	2849	2849	3306	3306	2899	1331	1834	1331	315	315	
19. Floor Loss B. t. u. per Hr.	9848	4032	4032	4032	4032	3240	3240							
20. Ceiling Loss B. t. u. per Hr.						3945	3945	53769	8880	11112	8880	2376	2376	
21. Leakage Loss B. t. u. per Hr.	37640	3360	10080	3360	10080	19080	19080	37630	10080	13440	10080	5600	5600	
22. Total Heat Loss	104338	19741	31240	19741	30140	85004	83143	148801	27919	41066	31919	9926	9954	
23. Deduct for Heater Size	16320	1680	5040	1680	5040	9540	9540	16320	5040	6720	5040	1800	1800	
24. Heater Building-loss Load	88018	18061	26900	18061	25100	75464	73603	132481	22933	40346	32933	8126	7954	
SERVICE														
25. Air Supply C. F. M.	4086	474	666	418	666	1683	1683	4094	740	1029	740	205	205	
26. Recirculation C. F. M.														
27. Air Supply Inlet Temp.	93.8	120°	120°	120°	112°	120°	120°	103.2	120°	120°	120°	120°	120°	
28. Air Supply B. t. u. Service														
29. Direct Rads. B. t. u. Service														
30. Direct Rads. sq. ft.														
31. Gravity Ind. Rads. sq. ft.														
32. Aspir. Coils Rads. sq. ft.														

Above is shown the data sheet completely filled in for this building Every item of heat loss is accounted for. The filled-in sheet is a detailed picture of the heating requirements

It will be seen that for this particular plan the inlet temperature do not vary much from 120 degrees.

The reader should save this copy of the AMERICAN ARTISAN, as we are going to design a complete system of fan blast warm air heating and ventilating for the included plan, and many references will be made to the data sheet and to these preliminary plans.





Above—Plan of the ground floor showing room numbers which are duplicated on the data sheet

Left—Plan of the first floor. These plans can be taken off the architect's drawings, if a new building, or drawn out in scale on replacement work

The central wall, 2 feet and 6 inches wide, will be used for supply and exhaust flues, and care must be taken not to place these flues where the beams that carry the Gym and Assembly Hall ceilings will rest.

In the next issue we will discuss the size of fan, heaters and motor.

A Puttyless Skylight

For Jake Kratcke, Ashland, Wisconsin

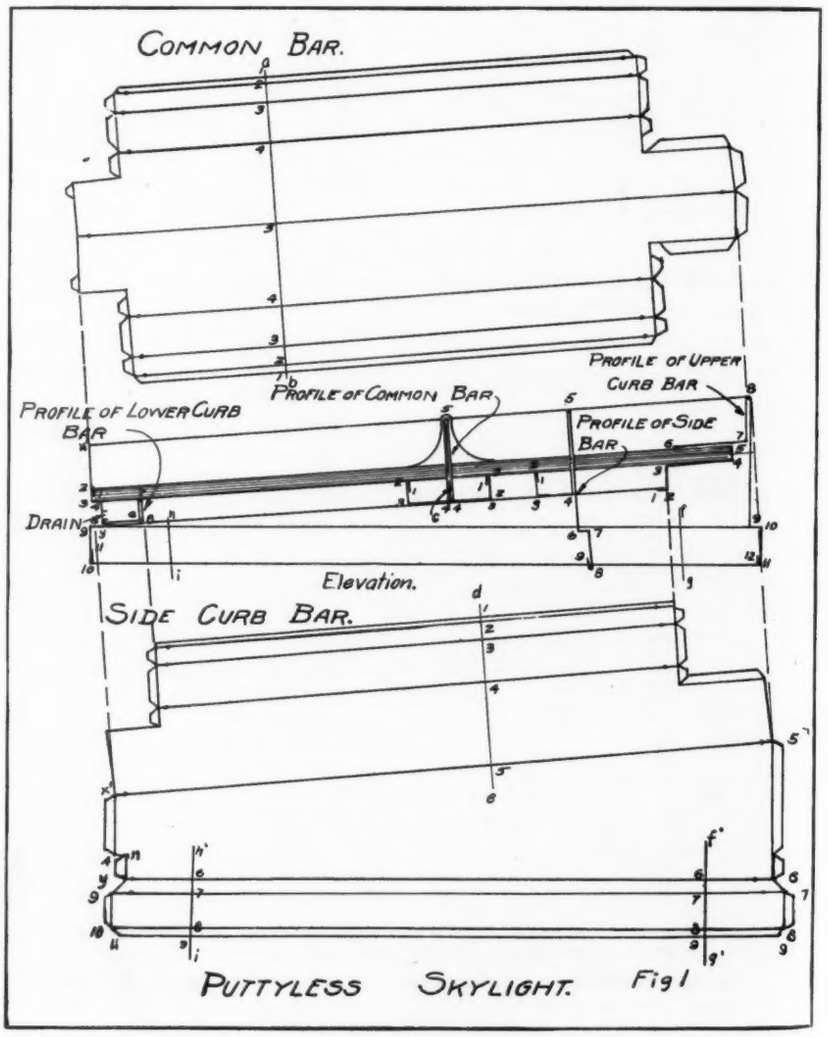
By **L. F. HYATT**
Contributing Editor

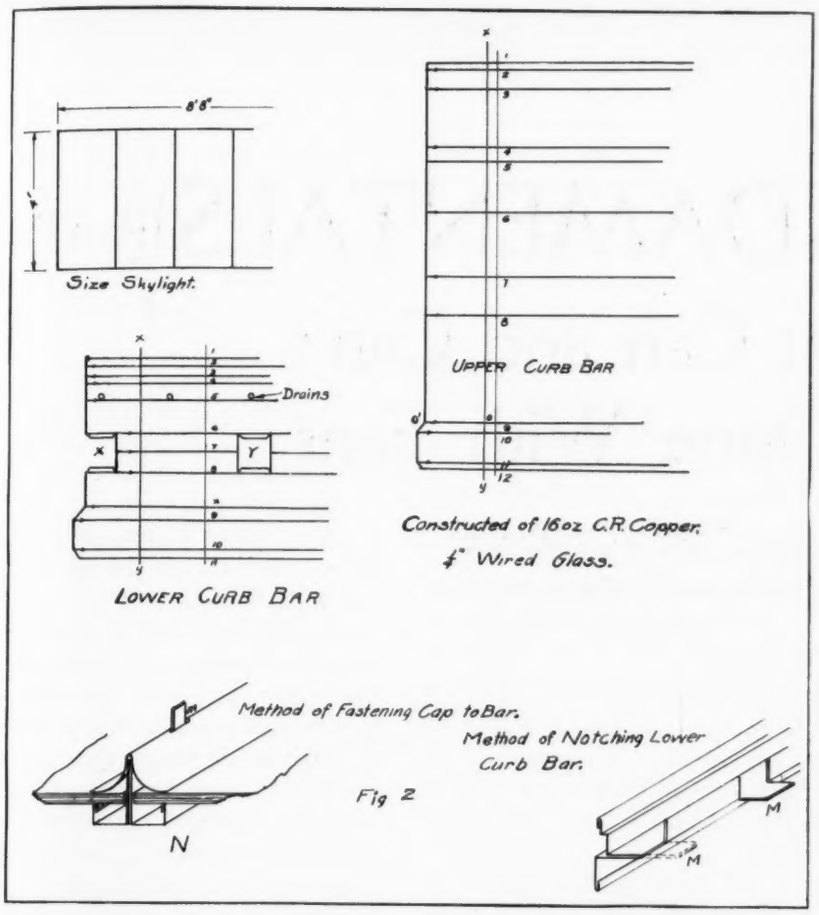
THE puttyless skylight pattern appearing in this issue of the AMERICAN ARTISAN was the request of a reader from Ashland, Wisconsin. The weight copper used for a skylight of this kind is usually 16 oz. C. R., and ¼-in. wired glass is used.

The method of developing the pattern is practically the same as the skylights where putty is used. First draw a side elevation as shown in Fig. 1 and upon this view will be found the profiles of the upper and lower curb bar, the side bar and the common bar. The common bar is drawn the desired slope, in this case a four-inch slope. Draw the stretchout line of the common bar a-b and upon this line step off the spaces found on the profile of the common bar. Now draw lines of indefinite length through these points. These lines are of course parallel with the slope of the common bar in the elevation view. The shape of the pattern is obtained as in all skylights by projecting lines as shown from point 2 and 8 on the elevation view. Add all laps as shown, for soldering bar in place and mark all bends with dots. To reinforce the common bar a piece is used as shown at *c* in the elevation.

To obtain a pattern for the side curb bar begin by drawing the stretchout line d-e at right angles to the common bar and of an indefinite length. Upon this line step off the distances 1 to 5 found upon the side bar profile. The upper part of the side bar is drawn the same as either half of the common bar. From point 5 on the pattern drop a perpendicular line and upon this line step off the distance 5 to 6, found on the profile of the side bar, and draw a horizontal line through point 6. Next draw perpendicular line f-g on the elevation any distance from point 9. Then draw line f'-g' the same distance from 6 that f-g is from 9. Upon this line step off the distances 6-7, 7-8, and 8-9, the remaining distances found on the profile of the side bar, and draw horizontal lines through 7, 8, and 9. Now step off distance f-10, found on the elevation, to the right of 7, 8 and 9. To complete the other end drop a perpendicular line from x' and step off the distance x to 4, 4 to y, etc., as before. The distance 4 to n is equal to the distance 3 to 4 found on the lower curb bar in the elevation view. Distances 7-9, 8-10, etc., are equal to the distance from h-i to 9.

The patterns for the upper and lower curb bars, Fig. 2, are developed by first drawing the stretchout lines and stepping off the distances found on the profile views





of the two bars, upon the elevation views. Through these points the horizontal lines are drawn as shown in Fig. 2. The procedure is the same as in the other bars. Draw vertical lines x-y. The other vertical lines could have coincided with these. Now step off from line x-y the distances from f-g to 9, 10, 11, and 12 on the elevation view and draw lines connecting the located points, and draw the perpendicular line from o'. The lower curb bar is cut out to receive the common and side bars as shown at x and y. These notches should be cut out wherever it is desired to place a common bar or a side bar, and should be the proper size to receive the bars. These notches may be cut after the bar is formed, as shown at M on sketch, which shows the method of notching the lower curb bar. The parts notched and turned down may be cut off as desired. At N, Fig. 2, is shown the common bar with the glass and cap in place. This cap is held in place by the strips coming up through the slit m. These are bent down over the cap holding it securely over the glass. This cap may be varied in shape, and often sheet lead is used under the edge of the cap, thus making it very nearly watertight. All bends must be made accurately. This completes the patterns for the various bars of the skylight.

Heating a Funeral Home

(*Continued from page 19*)

All the registers in the front are supplied from rectangular trunks and, in fact, no round pipe is used.

The main entrance hall and vestibule with one lead to reception room and two stacks to second floor are supplied from the two long trunks.

The return air system is composed of two trunk lines which run along the north and west sides of the building. One trunk brings air from the sun porch and the reception hall, while the rear line brings air from the workroom, display room and the entrance hall.

The two trunks are brought together above the blower and dump into a flat box across the two intakes of the Furblo wheel. The contractor used this type of construction, believing that by this arrangement the weight of the cold air would be equalized on both intakes. So far as can be determined this construction has worked out nicely.

In all the trunks a large quadrant damper is installed to help balance the system and also to regulate the amount of air delivered in various parts of the building. In a business such as this funeral home this was felt to be important, since at times large crowds may be expected in some rooms, while at other periods all the activity will be in others.

The furnace burns coal as a fuel. The operation of the damper and check is, however, automatically controlled by a thermostat located in the main hall. The fan cuts in when the bonnet thermostat reaches a temperature of 200 degrees and shuts off when the temperature falls to 185 degrees. These settings are perhaps somewhat higher than customary in residence work, but because of the use made of the building, circulation of even cool air was thought undesirable. With these settings only well warmed air is circulated.

All the registers throughout the house are of the baseboard type, while the return air grilles are of the floor type.

The new plant was installed early this winter and in spite of wide variations in temperatures has worked to everyone's satisfaction.

APPLIED FAN FUNDAMENTALS [Part IV]

What Can and Can't Be Done With Fans

By G. A. VOORHEES
Heating and Ventilating Engineer, Indianapolis, Ind.

SOME readers ask if it is necessary to use formulas in explaining the principles of fan heating. They say that they know nothing about algebra and that therefore they have trouble in handling formulas.

It is true that formulas used in fan heating *look like* algebra because they use letters to represent numerical values. It is true also that formulas in some branches of engineering work are so complicated that their use requires a working knowledge of advanced mathematics.

But in the ordinary run of heating and ventilating engineering, such as the practical warm air heating contractor encounters, *anyone who understands arithmetic can learn to use the formulas.*

The art of warm air heating today is based on scientifically correct engineering principles. And in all branches of engineering, the experience of many years has shown that formulas are decidedly better and *more practical* than verbal rules. They are more concise; they show at a glance what quantities or values are involved and how these values are related; they promote accuracy because of their simplicity.

The practical furnace man, therefore, who wants to keep fully abreast of the modern developments in his chosen field, should learn to make free use of formulas.

A formula, after all, is merely a mathematical rule expressed by means of letters and symbols (signs) instead of words. Take for illustration, the simple rule with which we are all familiar, that "the circumferance of a circle is equal to the diameter multiplied by 3.1416 inches.

Using the customary symbols of arithmetic, this rule might be written:

Circumference = Diameter × 3.1416

To shorten it still further, we may use the initial letters of the two words instead of the words themselves and we have:

$$C = D \times 3.1416$$

This is a formula and the following parallel comparison shows how much shorter and simpler it is than the original rule:

By Rule	By Formula
The circumference of a circle (25 letters)	**C**
is equal to (9 letters)	**=**
the diameter (11 letters)	**D**
multiplied by (12 letters)	**×**
3.1416	**3.1416**

Thus, aside from the number 3.1416, which is the same in both the rule and the formula, the number of characters in the rule is 57 and in the formula only 4.

In designing fan systems of warm air heating, some of the rules which the thoroughly up-to-date heating man would have to use, are so cumbersome when expressed in words that there would be a considerable chance of error. As formulas, these same rules are readily understood and easily applied at a saving of time and effort.

A wealth of general engineering information is being made available in practical form today for the use of the alert, progressive heating contractor who is ready to receive it and put it to profitable use in his own business. Much of the most valuable parts of such information is expressed in simple, practical formulas and it is well worth the heating contractor's time and effort to become familiar with these profitable, practical, labor saving formulas.

The following rules are sufficient for making practical use of most of the formulas usually met in warm air heating work:

Rule I—Substitution. All of the letters to the right of the equal sign (=) represent numerical values which must be known to solve a given problem. Replace these letters by the numbers which they rep-

Formula I

$$L = 1.75 \times G \times \left\{ 1 + 0.02 \times \left(\frac{S}{G} - 20 \right) \right\}$$

resent in the given case.

Example: The Standard Code formula for determining the rated capacity of a furnace in square inches of leader pipe area is:

Formula I

in which

L = furnace capacity in square inches of leader area.
G = grate area in square inches.
S = area of heating surface in square inches.

Note that heating surface (S) and grate area (G) are the two and the only two variable factors that determine the heating capacity of the furnace. The numbers 1.75, 1, 0.02 and 20, remain the same for any furnace; only the heating surface and grate areas, represented respectively by S and G in the formula, vary. If these two values are known for a given furnace, the rated capacity of that furnace is readily determined and unless they are known the official rating of the furnace cannot be calculated.

Assume that for a given furnace, the grate area is found to be 346 square inches and the heating surface is 7540 square inches.

According to Rule I, the first step in solving the formula is to substitute for the letter S, its numerical value, 7540. The letter G occurs twice in the formula and we substitute its value 346 in each of these places. We then have:

Formula II

Rule II — Operations. Unless otherwise indicated, perform the operations of multiplication and division *before* those of addition or subtraction.

$$L = 1.75 \times 346 \times \left\{ 1 + 0.02 \times \left(\frac{7540}{346} - 20 \right) \right\}$$

Notice that this rule starts with the important phrase *"unless otherwise indicated."* It happens in solving this particular formula, that Rule III requires other steps to be taken before applying Rule II.

Rule III—Groups. A group is a collection of letters or numbers, or a combination of both letters and numbers, which *is treated as a single quantity.* Operations of multiplication, division, addition and subtraction *within* a group must therefore be performed first and the *order* in which they are performed is governed by Rule II.

Groups may be identified in either of the following ways:

1. By being written in the form of a fraction in which the fractional form indicates that the number above the line (called the numerator) is to be divided by the number below the line (the denominator).

The latter group is separated from the former by parentheses ( ) and the former, larger group is separated from the rest of the formula by braces { }

Within the group

$$\left(\frac{7540}{346} - 20 \right)$$

we have the fraction $\frac{7540}{346}$ and according to Rule III a fraction is also a group.

Therefore, the innermost group in this formula is the fraction 7540/346 and since, in arithmetic, a fraction is an indicated division, this fraction really means 7540 ÷ 346. Performing the indicated division, we get the quotient 21.8 and we substitute this "simplified" value of the innermost group in equation (2) which gives us:

Formula III

In equation (3) the innermost group is (21.8 — 20) and as the indicated operation is substraction, we subtract 20 from 21.8, leaving 1.8 as the simplified form of this group. Substituting 1.8 for the former group (21.8 — 20) our formula becomes:

Formulas III and IV

$$L = 1.75 \times 346 \times \{1 + 0.02 \times (21.8 - 20)\} \quad \text{.....(3)}$$

$$L = 1.75 \times 346 \times \{1 + 0.02 \times 1.8\} \quad \text{.....(4)}$$

2. By being separated from the rest of the formula by signs of aggregation such as parentheses ( ), brackets [ ] and braces { }

Rule IV — Groups Within Groups. If there are several groups, one within another, start with the innermost group and work outward, performing the indicated operations within each group separately and in turn.

Example: The largest *group* we have in formula (2) is the expression:

$$\left\{ 1 + 0.02 \times \left(\frac{7540}{346} - 20 \right) \right\}$$

and within that group we have another:

$$\left(\frac{7540}{346} - 20 \right)$$

Formula IV

The remaining group in equation (4) is $\{1 + 0.02 \times 1.8\}$ in which two operations, addition and multiplication, are indicated. Rule II tells us that multiplication must be performed before addition so we multiply 0.02 by 1.8 and get as our product 0.036 which changes our final group to $\{1 + 0.036\}$. The next and last operation within the group is the addition of 1 and 0.036 as the final simplified value of the largest group.

Formula (4) then becomes:

$$L = 1.75 \times 346 \times 1.036 = 627$$

Thus, 627 square inches of basement leader pipe area is the official capacity given to a furnace by the National Warm Air Heating Association if the furnace has a grate area of 346 square inches and a heating surface area of 7540 square inches.

To those readers who are not familiar with formulas and who are interested in learning to use them in a practical way, it is suggested that the following problems be solved. The answer to each is given and if any trouble is encountered in arriving at the correct answer,

send your solution to the AMERICAN ARTISAN or direct to the writer at 633 South Delaware Street, Indianapolis. Your solutions will not be published, but will be corrected and returned direct to you with suggestions which will help to give you a practical working knowledge of such types of formulas as you are likely to encounter in your study of the fundamental principles of furnace fan heating.

Problem No. 1. We all know that warm air is "light" and cold air is "heavy" but it is sometimes of value to know just what this difference in weight is. It can be calculated from the approximate formula:

$$W = \frac{39.7}{T + 460}$$

in which

W = weight in pounds of one cubic foot of air at the given temperature.

T = temperature of the air in degrees Fahr.

By use of the formula, find the weight of one cubic foot of air when its temperature is 70 deg. F. **Ans.—0.075 lbs.**

Problem No. 2. Using the same formula, find the weight of one cubic foot of air at a temperature of zero. **Ans.—0.086 lbs.**

Problem No. 3. The heating value of coal in B.t.u. per pound can be calculated if the proportions of carbon, hydrogen, oxygen and sulphur per pound of the coal are known, the formula being:

Formula V

in which

B.t.u. = heat value of the coal in B.t.u. per pound.

C = proportion of carbon in the coal.

H = proportion of hydrogen in the coal.

O = proportion of oxygen in the coal.

S = proportion of sulphur in the coal.

By means of this formula find the heating value of a coal in which C = 0.7479, H = 0.0498, O = 0.0642, and S = 0.0324. **Ans. —13,650 B.t.u. per pound.**

Problem No. 4. The speed of a belt driven fan in revolutions per minute is found by means of the formula

$$r = \frac{D \times R}{d}$$

in which

D = diameter of motor pulley in inches.

d = diameter of fan pulley in inches.

R = speed of motor, revolutions per minute.

r = speed of fan, revolutions per minute.

If a fan having a 12-inch pulley is driven by a 1750-r.p.m. motor having a 1½-inch pulley, what will be the speed of the fan in revolutions per minute? **Ans.—219 r.p.m.**

Problem No. 5. The mathematically correct formula for determining the exact length of belt needed to connect two pulleys of known diameter with a definite distance from center to center of the pulleys, is quite complicated and impractical for application to belt driven furnace fans. But the following *approximate* formula from Kent's "Mathematical Engineers Handbook" gives results sufficiently accurate for all ordinary use:

$$L = 3.25 \times \frac{D + d}{2} + 2 \times C$$

in which

L = length of belt in inches.

D = diameter of motor pulley in inches.

d = diameter of fan pulley in inches.

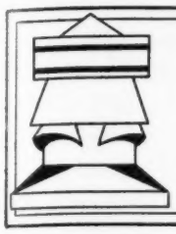
C = center-to-center distance between pulleys in inches.

What length of belt will be required if the distance, center to center, between the pulleys is 36 inches, the diameter of the motor pulley 3 inches and of the fan pulley 6 inches? **Ans. — 86⅝ inches.**

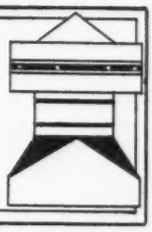
Formula V

$$\text{B.t.u.} = 14{,}600 \times C + 62{,}000 \times \left(H - \frac{O}{8} \right) + 4{,}000 \times S$$

You can't get very far into the engineering phases of heating unless you can work out simple formulas. Also you will want to be able to solve formulas in order to understand technical discussions. We feel that this article on formulas is as valuable a discussion as anything heretofore published. We invite your questions, comments, or discussion



GRAVITY EXHAUST VENTILATION



Figuring Ventilator Sizes

By **PAUL R. JORDAN***

THESE articles in the ventilation department are interesting to me because they show how varied are the problems the ventilation contractor faces. For example, a reader recently wrote:

"I was much interested in an article which appeared on page 40 in the Feb. 16th issue of AMERICAN ARTISAN written by you. This was an answer to a problem presented by A. H. Cramer of Tiffin, Ohio. In the article you agree, if given dimensions, to explain to Mr. Cramer how you figure the sizes of required ventilators.

"For the benefit of other metal workers who are often faced with similar problems, I, and no doubt others, would be thankful to you if your explanation can be given.

"Just for an example, the attic spaces are 1st front space 15 ft. wide, 20 ft. long, 3 ft. high in front, 1½ ft. high at rear, and 2nd back space is 15 ft. wide, 15 ft. long, 2½ ft. high at front, and 1¼ ft. at lower head."

To this definite sizing of the Cramer problem, I would say:

First, I will give the rules for figuring jobs of this kind and then will show the application of these rules as applied to the dimensions enclosed in your subscriber's letter.

This is a moisture removal problem and we have no way of knowing just how much moisture there is given off into this roof space because Mr. Cramer has not thrown any light on the source of this moisture. I have assumed that the actual amount of moisture given off into the air is comparatively small and that the harm is done by the accumulation of this moisture over a comparatively long period of time and then the releasing of it during a short period. The frost probably accumulates constantly during cold weather between melting periods. Once the temperature comes up to the point necessary to melt this frost, the melting goes on rapidly as long as frost remains.

My assumption that the amount of moisture released into the roof space is small, is a safe one in the absence of any direct evidence to the contrary. It is very likely that any source of moisture, releasing it in great quantities into this roof space, would be immediately noticeable and would be included in any report or survey of the situation.

We may use then as a basis of roof space ventilation the same basis which we use for heat removal. It is fairly certain that heat removal in the summer will be desirable and that the owner will welcome a system which will be satisfactory from a heat removal standpoint as well as from a standpoint of moisture removal. At the same time it is probable that a heat removal ventilation system will be adequate for moisture removal.

To finish with the subject of moisture removal as to its general principles, we may add that having used the heat removal formula as a basis, we must bring to bear common sense in the event of any necessity for an increase beyond this basis. If it should so happen that there is a considerable amount of moisture being released into this roof space from some definite source, then that would become a subject for consideration, and enough capacity would have to be added to the heat removal figures to take care of an extreme condition. This does not apply to Mr. Cramer's case as the condition does not seem to be at all extreme.

Now as to the application of the heat removal formula. The heat removal formula is to multiply the number of square feet of roof space by 80; the result will be the number of cubic feet per hour required.

The formula as stated above ignores height. This is due to the fact that transmission of heat into the roof space either from heat through the roof or artificial heat from the interior is based on square feet of ceiling or roof and not on cubic feet of space content. It is certain that a high roof space will require no more ventilation than a low one, so that the sensibleness of the formula in this regard is apparent.

In applying this formula to the hypothetical case suggested by your subscriber, we will handle these two attic spaces as if they were entirely separate. As far as I know they are. The front one is 15 ft. by 30 ft. long. This gives you 300 square feet. Multiplying 300 square feet by 80 gives you 24,000 cubic feet as the ventilating capacity required. My table of capacities for Aeroplane Rotary ventilators on an open

**The Paul R. Jordan Co., Indianapolis, Indiana.*

roof installation gives 12-inch as the size ventilator to be used for a 24,000 cubic feet per hour capacity required on an open roof installation. In order to maintain the capacities in an installation of this kind equal to that of an open roof installation it is necessary that ample and not restricted intake be provided. If two louvered intakes are used to take care of the front space, one intake on each side of the building, theoretically 6 by 12-inch intakes would be sufficient, but actually louver interference and friction must be taken into consideration. Therefore, it would be better to use two 8 by 12-inch, or even 10 by 12-inch intakes.

Now as to the rear space 15 feet wide by 15 feet long, that is 225 square feet multiplied by 80 which gives you 18,000 cubic feet as the necessary capacity. We do not list smaller than a 12-inch ventilator because we do not approve of their use under ordinary circumstances where ventilating capacity is needed. The proportionate cost on the basis of capacity is so much less than that of a 10-inch, 8-inch, 6-inch or 4-inch, that always recommend the use of a 12-inch where ventilation is needed. I would, therefore, use a 12-inch ventilator on the rear space also.

I am rather sorry that your subscriber mentioned figures so small because such small roof spaces are unusual and the casual reader may forget the roof space size and remember the ventilator size to his undoing. Let me state then that a 12-inch ventilator is seldom large enough for a roof space of anything excepting a small residence. A roof space of an ordinary apartment would require several ventilators much larger than 12-inch.

It is true that in applying the formula for ventilator size we do not take the height of the roof space into consideration. Height does, however, become an element for consideration in determining the type of ventilator to be used. For a roof space this low I would not use anything excepting a rotary ventilator because positive suction will be necessary to draw the air through the comparatively horizontal space against more or less friction. If this roof space were more than 5 feet high then a good stationary ventilator might be used, although a rotary would be better.

It might be well to say a word about ventilator capacities. In figuring any ventilation job be sure that the capacity tables you use are conservative. There are many good usable capacity tables published, but there are some that are not. In choosing a table for engineering use it is safer to assume that a high table is incorrect than it is to assume that the device tabulated has a high efficiency. The efficiency of recognized standard manufactured products do not vary as much as some of their manufacturers would like to have you believe. Homemade products are usually terrible in efficiency. Some manufactured products overlook certain basic principles to their detriment; but none of them has any startling advantage in efficiency over the best of its competitors.

Allow me to suggest to your subscriber that he avail himself of the engineering service offered by the ventilator manufacturer. It is well for him to know as much as possible about ventilation figuring and estimating; and he will find that he will best be able to develop such knowledge by having the engineering department of the manufacturer either give him a layout or check his own layout.

Ventilating the Detroit-Windsor Tunnel

(*Continued from page 29*)

bon-monoxide to 10,000 parts of fresh air, is approved by the United States Bureau of Mines as permissible for public safety, and serves as a standard adopted for the ventilation system of the Detroit subway.

The experience of Holland Tunnel officials, indicated that even this small amount of carbon-monoxide rarely will be found in the tunnel. The only real test of the New York ventilation system came on the opening day of the Holland tube. On that day, 52,000 vehicles passed through the new tunnel, 98 per cent of them being passenger cars. During the first 24 hours, the average carbon-monoxide content was .69 part per 10,000 parts of air. Even during the peak hour of the day, the average carbon-monoxide content was but 1.58 per 10,000 in one tube and 1.60 in the other. A similar condition may be expected for the

(*Continued on page 40*)

STATISTICAL COMPARISON OF AMERICAN TRAFFIC TUNNELS

Name	Time to Complete	Type of Construction	Length ft.	Diameter ft.	Width of Rd. ft.	No. of Fans	Total Air Capacity Per Minute cu. ft.	Total H. P. h. p.	Type of Drive
Detroit-Windsor	30 Months	Steel Shield driven and Pipes sunk in place reinforced with concrete on both sides.	5,845	31	22 & 28	24	1,500,000	1,466	Link-Belt Silent Chain
Geo. A. Posey	40 Months	Precast reinforced concrete sections sunk and boring.	4,436	38	22	16	1,000,000	1,200	Link-Belt Silent Chain
Holland Tunnel	36 Months	Boring.	9,250	32	22	84	3,761,000	6,333	Link-Belt Silent Chain

The N. A. S. M. C. Job Cost and Workman's Order Sheets

By **FRANK C. PARK**
Trade Association Service Co.

ON this page is shown one of the job cost record forms adopted by the N. A. S. M. C. completely filled out. The sheets show all the details pertaining to a particular job. The other form shown illustrates how a workman's order sheet should be filled in for the same job with all the information given by the workman. These two forms show how the system should work on a typical job.

In the extreme right hand corner is the number of the job just completed. Following is the name and address of the customer. Then comes a record of the men working on the job, together with a description of what work was ordered. Finally is a notice of the authorization, then a written record of the time started and time finished.

All of this is valuable information to have for checking purposes, and as a reference for estimating purposes on similar future work.

Immediately under this general information is a list of every item of material that was used on the job. Notice the large amount of information that is contained in a small space. And notice how valuable this information is to you when the time comes to bill the job to the customer.

It is not always possible to order just the right quantity of material, nor to take just the correct quantity from your store room to the job. Unless some careful check is kept of the material, some will be lost or destroyed. The first three columns of this form enable you to

LABOR

DATE	HOURS	HOURS	HOURS	HOURS
WORKMAN	J	J	J	H
Jones	8			
Smith	8			
Wills	8			
Lennon	4			
Helper				8
"				8
"				8
"				4
TOTAL HOURS	28			28

COST RECAPITULATION

MATERIAL	121	03
LABOR	42	00
PERMIT	—	
FREIGHT-EXPRESS-DRAYAGE	—	
INCIDENTAL EXPENSE	—	
FOREMAN	—	
DIRECT COST	163	03
OVERHEAD EXPENSE	29	40
TOTAL COST	192	43
SELLING PRICE	213	81
LESS COST	192	43
PROFIT	$ 21	38
LOSS		

JOB RECORD JOB NO. 962

NAME J P Patterson DATE 6-2 1930
LOCATION OF JOB 2462 Smith Ave
WORKMAN Jones - Smith - Wills - Lennon
KIND OF WORK Copper Roofing
ORDERED BY J P P
DATE STARTED 6-2- HOUR 8 a.m. DATE FINISHED 6-2- HOUR 4:30 p.m.

MATERIAL TAKEN	MATERIAL USED	MATERIAL RETURN	DESCRIPTION OF ITEMS	COST @	COST AMOUNT	SELLING PRICE @	SELLING PRICE AMOUNT
350	327	23	lbs 16 oz Soft Copper	28	91 56		
5	3½	1½	lbs 1" Copper Nails	30	1 05		
20	17	3	lbs Solder	30	5 10		
60	31	29	4" Cor. Copper Conductor	38	11 78		
10	6	4	" Conductor paste	10	60		
5	5	—	Slate Paint	1.50	8 75		
			Charcoal - Flux, Etc		2 19		
			Material Cost	#	121 03		
			Labor J 28 hrs @	1.00	28 00		
			" F 28 " "	.50	14 00		
			Direct Cost	#	163 03		
			Overhead 70% of Pro Labor		29 40		
			Total Cost	#	192 43		
			Profit 10% on Selling Price		21 38		
			Selling Price	#	213 81		

LABOR

DATE	HOURS	HOURS	HOURS	HOURS
WORKMAN	J	J	J	H
Jones	8			
Smith	8			
Wills	8			
Lennon	4			
Helper				8
"				8
"				8
"				4
TOTAL HOURS	28			28

OTHER EXPENSES

WORKMAN'S ORDER JOB NO. 962

NAME J P Patterson DATE 6-2- 1930
LOCATION OF WORK 2462 Smith Ave
WORKMAN Jones - Smith - Wills - Lennon
KIND OF WORK Copper Roofing
ORDERED BY J P P
DATE STARTED 6-2 HOUR 8 a.m. DATE FINISHED 6-2- HOUR 4:30 p.m.

MATERIAL TAKEN	MATERIAL USED	MATERIAL RETURN	TAKE NOTICE — NO WORK OTHER THAN SPECIFIED ABOVE TO BE DONE WITHOUT SIGNED ORDER — DESCRIPTION OF ITEMS USED
350	327	23	lbs 16 oz Soft Copper
5	3½	1½	lbs 1" Copper Nails
20	17	3	lbs Solder
60	31	29	4" Cor. Copper Conductor
10	6	4	Conductor paste
5	5	—	Slate Paint
			Charcoal - Flux Etc

CAR CHECKS	
TRUCKS	
GASOLINE	✓
SOLDER	✓
CANDLES	
SCREWS	
PACKING	
CEMENT	
PUTTY	
PAINT	✓
RIVETS	
NUTS-BOLTS	
NAILS	✓
CHARCOAL	✓

CUSTOMERS SIGNATURE J P Patterson

This is the front of a Job Record sheet all filled out. Every bit of necessary information is contained on the sheet. The sheet after filling in is filed

••••••••••••

The Workman's Order sheet is also complete and when filled in can be filed as a permanent record of what went on while the job was in progress. It can be used for future estimating

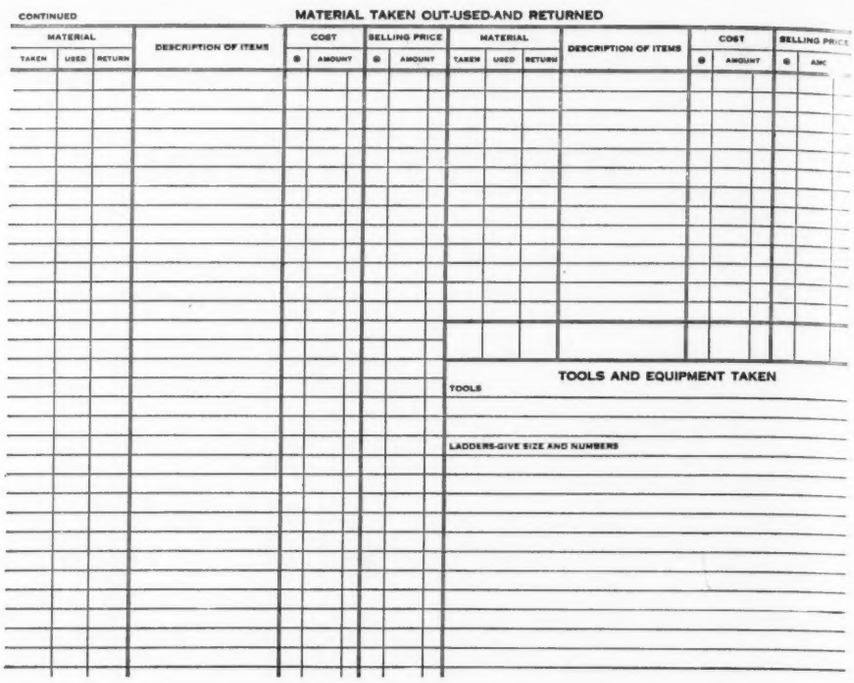
keep an exact count of how much of each item was taken out, used and returned. This guesswork will not work—the exact figures are there. This one feature of this form, if properly used, will stop expensive leaks and will show you more profit at the end of the year.

In the upper left hand corner is a record of the hours of labor that were required to do this particular job. No guesswork here either. You know that it required 28 hours of a journeyman's time and 28 hours of a helper's time to complete the job.

The extension in dollars and cents will vary for each section of the country. Just figure your own cost of materials and labor for each item, and you have a complete picture ofa job that might have been completed by you or your organization.

In the lower left hand corner is Cost Recapitulation, showing the amount of material, labor and other expenses that applied to the job, plus overhead expense, gives the total cost of the job. Deducting the cost from the selling price gives the profit that has been made on the job.

In figuring profit, in order to get 10 per cent net on the selling price, it should be figured as follows:


CONTINUED

MATERIAL TAKEN OUT-USED-AND RETURNED

MATERIAL			DESCRIPTION OF ITEMS	COST		SELLING PRICE		MATERIAL			DESCRIPTION OF ITEMS	COST		SELLING PRICE	
TAKEN	USED	RETURN		@	AMOUNT	@	AMOUNT	TAKEN	USED	RETURN		@	AMOUNT	@	AMC

TOOLS AND EQUIPMENT TAKEN

TOOLS

LADDERS-GIVE SIZE AND NUMBERS

This form, when properly kept, is a day-by-day record of the materials you use. It can be used to order from, estimate, and also for inventory. It might be used to keep track of how close to your estimate your job ran

Cost or $192.43 by 100 and divided by 90 will give the selling price of $213.81 or a profit of $21.83.

Another feature of this Job Cost Record Form is, that just as soon as the job is completed and invoiced, it is torn from the pad and transferred to the accounts receivable ledger, eliminating the necessity of re-writing the information on a ledger sheet, as the Job Record Form becomes the ledger sheet and is placed in its proper position or place.

By the use of these forms a contractor will know what he has made on every job or contract, no guesswork, as he will have all of his costs and figures on each job he does.

Ventilating the Detroit-Windsor Tunnel

(Continued from page 38)

Detroit tunnel, with the result that air in the tunnel, will be purer than air which we breathe in the congested areas of any of our large cities.

It will be interesting to note that three separate methods of construction were employed in building Detroit's great sub-aqueous highway to Canada. Probably the most spectacular construction feat was the fabrication, launching, towing and sinking of the nine steel tubes comprising the underwater portion of the tunnel. These tubes have an aggregate length of more than half a mile, all of which is under water.

A miniature city has been erected at each end of the tunnel, for housing tunnel officials, government officials and equipment. Some ten structures have been built on each side of the river. Terminal plazas are large so that traffic entering or leaving the tunnel, spreads out fanwise to facilitate rapid inspection by customs and immigration authorities. International travel at this point should take on a new spurt with the tunnel completed.

Mr. Burnside R. Value was the executive engineer in charge of the project, working under the direct supervision of Mr. Klapp of Parsons-Klapp-Brinkhoff & Douglas, consulting engineers.

NEW ITEMS and NEWS ITEMS
From and about the Manufacturers and Jobbers

J. E. Wampler, Veteran Furnace Man, Passes On

Joseph E. Wampler, one of Irwin, Pennsylvania's, oldest and most successful business men, and a reader of AMERICAN ARTISAN for the past 35 years, passed away on Wednesday evening, April 17.

Mr. Wampler, who had been in business in Irwin for the past 52 years, had been a distributor of Torrid Zone furnaces in western Pennsylvania for 35 years.

He was an outstanding example of a successful warm air heating contractor and had accumulated a substantial amount of wealth.

In spite of the fact that he worked consistently at his business, he found time for recreation. He was an expert marksman and at one time won the national championship in shooting glass balls, and was a frequent tournament winner in his younger days.

He was a member of a number of trapshooting associations, a member of the First Presbyterian church of Irwin, a charter member of the Kiwanis club, and at the time of his death was an honorary member of that organization.

His son, John E. Wampler, who has been closely associated with his father in business for several years, will continue the business under the name of J. E. Wampler.

J. C. Miles Elected Director of New Canadian Fan Co.

J. C. Miles, inventor of the Miles Warm Air Furnace Fan, has been elected vice-president and director in the newly formed Miles Automatic Furnace Fans, Ltd., Canada. This new corporation, operating from Ingersoll, Ontario, will have charge of all Canadian distribution of the Miles fan, which has met with so much success in the United States.

Mr. Miles' latest affiliation climaxes a long record of accomplishment as a heating engineer and inventor. Mr. Miles first saw the possibilities of a fan with automatic louvres while engaged in designing and installing heating units for large public buildings. Addresses made before heating engineers and students all over the country by Mr. Miles did much to awaken them to the future of warm air heating.

J. Wiss & Sons Company Offer Two New Snips

In the "Nu-Grip" snips just placed on the market by J. Wiss & Sons Company of Newark, New Jersey, the manufacturers feel they have a snips that will prove a sensation in the metal cutting trade.

They are made of crucible tool steel,

Wiss U-7 and U-8½ Snips

Wiss UC-8 Snips

perfectly hardened and tempered and fitted with hardened bolt and nut.

The Wiss U-7 and U-8½ snips regular pattern is designed for straight work.

The Wiss UC-8 combination pattern is for curved, irregular and straight work.

Oil-O-Matic Publishes New Oil Heating Manual

A recent contribution to oil burner literature is the revised edition of the Architect's Manual, published by the Williams Oil-O-Matic Heating Corporation, entitled "New Facts on Oil Heating for Architects and Engineers."

This new book is standard file size and consists of 36 pages, with diagrams and illustrations. Oil-O-Matic fundamentals and pictures of various types of buildings with Williams Oil-O-Matic heating are shown.

Suggested oil burner specifications and regulations of the National Board of Fire Underwriters are also included as a part of the manual.

Copies of "New Facts for Oil Heating for Architects and Engineers" will gladly be furnished by the factory at Bloomington, Ill., and written on his business stationery.

Columbus "Automatic Air Conditioner for the Home" Humidifier

During the recent meeting of the National Warm Air Heating Association at Columbus, the Columbus Humidifier Company of that city had on display their new Columbus "Automatic Air Conditioner for the Home" Humidifier.

The outstanding feature of the Columbus Humidifier is its Fin Cooled Valve, which is positive in action at all times, and absolutely, the manufacturers say, eliminates dripping.

For two years the manufacturers have worked steadily, discarding model after model, until their present cold water valve, entirely automatic, non-drip humidifier has been perfected. The valve operates from one to three times an hour, depending on the evaporation required, and remains tightly closed at all other times.

All working and moving parts are of bronze. The entire valve and mechanism can be removed for examination with a screwdriver. The valve and mechanism will not stick, bend or freeze, and the float will stand 1300 degrees and will not water-log.

The manufacturers have a very attractive mailing piece describing their humidifier which they will send on request.

Rock Island Register Issues New Catalogue

The Rock Island Register Company, Rock Island, Ill., now has ready for distribution a new catalogue showing the company's complete line of manufactured units and also the materials jobbed.

The complete line of No-Streak registers are shown accompanied by full details and dimensions. The catalogue also shows the company's line of cold air faces and grilles.

In addition to details, prices for all units are also shown.

The company also jobs a complete assortment of furnace fittings and such equipment as fans, blowers, and working tools.

A copy of the catalogue can be had from the company.

M. P. Ohlsen President and General Manager of Schwab Furnace and Mfg. Co.

An announcement of real interest to the trade has just been made by the Schwab Furnace and Manufacturing Company, Cedar Grove, Wis., that Henry E. and Charles E. Schwab have severed their active connections with the company.

M. P. Ohlsen

Mark P. Ohlsen, the newly appointed president and general manager, has been successfully in the manufacturing business for the past 30 years.

A. G. Pomrening ("Pom"), vice-president and sales manager, is well known to the trade because of his connection as sales manager of the old firm for the past 22 years.

A. G. Pomrening

George B. Currie, an attorney, is the new secretary, and D. W. Huenink, cashier of the Citizens State Bank of Sheboygan, is treasurer.

New capital has been put in the company, large reductions made in the operating expense, and with the new officers at the helm, prospects are bright for the new company.

The Milwaukee warehouse and office has been moved from 605 South First Street to 522 West Cherry Street, but the executive offices and manufacturing plant will continue to be at Cedar Grove, Wis.

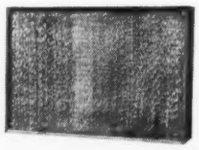
New Equipment for Making Pipe Joint Tape Installed by Grant Wilson, Inc.

Grant Wilson, Incorporated, 4101 West Taylor Street, Chicago, have announced the fact that they now have equipment in Chicago for making any width pipe joint tape from 2 in. up.

In the announcement sent to the trade the company say that they have put in this equipment because they feel that within a very short time the use of machine made tape and machine cut segments in continuous roll form will become almost universal, and therefore they are preparing to meet the demand.

Kleenaire Filter Company New Filter Ready

The Kleenaire Filter Co., Stevens Point, Wis., have brought out a new filter that embodies the same principle of operation (centrifugal) as the



older filter, but is said to possess a higher efficiency and can be used dry.

Further, the air passages remain open even when the filter is carrying a heavy dust load, and the resistance to the air is much lower than any filter the company has made. Literature on this new filter is now ready.

J. W. Barker President Andes Range & Furnace Corp.

Jesse W. Barker was elected president of the Andes Range & Furnace Corp., Geneva, N. Y., at a recent meeting of the board of directors. He has been connected with the company for more than 30 years, his previous office being secretary of the firm. Other officers elected were Theodore J. Smith, chairman of the board; Fred C. Manss, vice-president in charge of sales; Donald C. Hutchins, secretary, and Phillip Heimlich, treasurer.

The reorganization and election of the new president were made necessary by the death of Sidney S. Smith, head of the company, who was fatally injured in a hunting accident last fall.

Emerson Electric Mfg. Co. Making New Blower

The Emerson Electric Company, St. Louis, manufacturers of the Emerson propeller fans, now has ready for distribution a new blower incorporating some unusual features of design.

The unit is claimed to be especially quiet. The motor is on the wheel axle and operates with a 3-speed switch. The free air delivery is from 955 to 2540 c.f.m. In addition, eight speeds for the blower, 300 to 820 r.p.m., are provided.

In the design and construction of the Emerson Furnace Blower, quiet operation was given special consideration. Extreme quietness of operation was achieved in three ways:

(1) By having the blower wheels direct-connected to the motor, thus avoiding belts and pulleys.

(2) The blower wheel is of improved design and moves a large volume of air with the minimum of sound. Backward curved blades are used.

(3) The motor was specially designed and built to assure quiet operation. The motor has a special spoke and rubber mounting which deadens vibration and which absorbs electrical and mechanical sound.

The motor has no brushes, starting device or sliding contacts of any kind and positively does not interfere with radio reception at any time. Motor bearings are packed with wool and require relubrication but once a season.

The motor is said to have unusually high efficiency, low starting current, and is designed for connection direct to the lighting circuit. Connections for 110 and 220 volts are provided. For commercial installations where 3-phase power circuit is available, this motor may be operated from any two wires of the 3-phase circuit.

The blower cabinet is substantially built of heavy gauge iron sheets on angle iron frame.

Moncrief Appoints Pacific Northwest Distributors

The Henry Furnace and Foundry Company have just announced that the McPherson Furnace & Equipment Company of Seattle, Wash., have taken on the Moncrief line of Steel Furnaces and will act as distributors for this line in the Pacific Northwest.

A. W. Biever and Co., Hold Sales Meeting at Mooseheart

On Friday, April 10, the A. W. Biever and Company of Aurora, Ill., held a meeting of dealers and salesmen at Mooseheart, the famous institution of the Loyal Order of Moose.

More than one hundred dealers attended the get-together meeting.

The first part of the program was given over to visiting and inspecting the shops and grounds of Mooseheart. The men were divided into groups in charge of an official, and taken through the shops and buildings.

Later in the afternoon the visitors gathered in the auditorium where A. W. Biever, president of the Biever company, welcomed the men. He stressed the importance of using better materials and of getting a fair and reasonable profit from all work done. Such a program, the speaker said, would do much to eliminate cheap competition, especially when the legitimate contractors of any community lived up to an agreement to make a profit.

Joe Walters, President of the Illinois Sheet Metal Contractors' Association, spoke briefly on the work of the state association and extended an invitation to all present to attend the Illinois state convention to be held in Chicago preceding the National convention in May.

The next speaker was Charles Siebert of the Barnes Metal Products Company. His subject was "Eavetrough and How It Is Made." This discussion contained much of interest and value.

George Steck and Henry Pavey of Republic Steel Corporation gave an interesting and instructive talk on the manufacture of Toncan iron. The address explained how the metal is made, how the impurities are removed and how many tests and analyses are made to insure uniformity and quality.

A speaker not listed on the program but one whose address was carefully followed was James J. Davis, one time Secretary of Labor, and for years past guiding director of the destinies of Mooseheart.

Mr. Davis related how as a boy of ten he had worked in a sheet mill and briefly sketched conditions in the steel industry twenty-five years ago. Conditions then were compared with those of today and from this background of personal experience, Secretary Davis gave a picture of future developments in steel. Mention was made of the wide uses of sheet metal abroad and the speaker confidently predicted that similar usage would shortly occur in the United States.

A banquet was given the visitors accompanied by entertainment by boys and girls of Mooseheart. After the dinner a general discussion of the sheet metal contractor's problems was held.

Thanks for the splendid entertainment and co-operation were tendered J. A. Brandt, head of the sheet metal department of Mooseheart. In a brief talk Mr. Brandt sketched the work of the sheet metal department and explained the comprehensive plans for future expansion of the department. V. A. Bird of Mooseheart was in charge of the tour of inspection and the entertainment. Thanks for his splendid work were also tendered.

J. H. Morris Secretary Inland Steel Company

At a meeting of the board of directors, held Tuesday, April 28, J. H. Morris was elected secretary of the Inland Steel Company, succeeding W. D. Truesdale, who has served as secretary and treasurer. Mr. Truesdale remains treasurer. Mr. Morris was first associated with Inland in 1908; then after an absence of nine years returned to the company in 1917. He was elected assistant secretary and assistant treasurer in 1923. All other officers of the Inland Steel Company were re-elected by the directors.

INSTALL FURNACES
of Boiler Plate Construction

Boiler Plate Construction insures warmer homes, insured consumer satisfaction, and brings to the dealer a more substantial business foundation.

PEERLESS BOILER PLATE CONSTRUCTION

Peerless Boiler Plate **is only one of the built-in quality line. There is also the *Peerless Pleasant Home*, a competitive priced steel furnace—and the *Peerless* built-in quality *Cast Iron* at a price that gets the business.**

No boiler plate furnace manufactured can boast of so many built-in features as those of PEERLESS. Space will not permit giving a complete description of the PEERLESS BOILER PLATE. A few of the features are heavier radiators and crescent shaped, automatic damper control, down draft combustion, interlocking collars, heavy, rugged front and aluminum finish.

Let us send you a descriptive folder on this furnace and tell you about the "Local Market Survey" as supplied profit making PEERLESS dealers. Write today!

THE PEERLESS FOUNDRY COMPANY, Inc.
INDIANAPOLIS INDIANA

Bailey Farrel Mfg. Co.
Warehouse Distributors
Pittsburgh Pa.

Handy Pipe Is Handy

—By Name
—To Get
—To Use

It Is Built to
Outlast the Homes
It Goes Into

F. Meyer & Bro. Co.
Peoria Illinois

ON
Cash In Public Demand
"HOME COOLING"
During the Summer Months

KORECTAIRE
The CORRECT AIR MACHINE

Dealers everywhere are making Big money selling blower and fan equipment for home cooling during the summer as well as for forced heat in winter. The "Korectaire" meets these requirements and each installation is your best advertisement.

The "Korectaire" is a positive pressure blower. It humidifies and cleans the air.
It is quiet, easy to install, and lends itself readily to any number of air returns.
Let us send you illustrated literature and prices.

Write for Full Details Today

WATT MFG. COMPANY STERLING ILLINOIS

The Agency for the
GILTEDGE FURNACE
has always been a profit maker for the dealer
Write for agency details today
SCHWAB FURNACE & MFG. CO.
Box 7 Cedar Grove, Wis.
Warehouse at Milwaukee

A-C Thermostatically Controlled
Automatic
HEAT BOOSTER
MAKES EVERY INSTALLATION BETTER
Builds customer satisfaction and boosts the efficiency of every installation.
Investigate the A-C.
THE UNIT TO SELL
WRITE FOR CATALOG and Name of Nearest Jobber
Sell an A-C as part of every installation. It will make a good profit for you and make a booster of the customer.

A-C Manufacturing Co.
417 Sherman Ave., Pontiac, Ill.

You

want to increase your furnace business

WE

want to tell you how it can be done

WRITE!

The Graff Furnace Co.

Scranton, Penna.

New York City Sales Office: 116-118 Wooster St.

FAULTLESS WARM AIR FURNACES

PERFORATED METALS

All Sizes and Shapes of Holes
In Steel, Zinc, Brass, Copper, Tinplate, etc.
For All Screening, Ventilating and Draining
EVERYTHING IN PERFORATING METAL

THE HARRINGTON & KING PERFORATING CO.

5649 FILLMORE ST.-CHICAGO, ILL., U. S. A.

NEW YORK OFFICE, 114 LIBERTY ST.

FURNACE STOVE AND RANGE REPAIRS

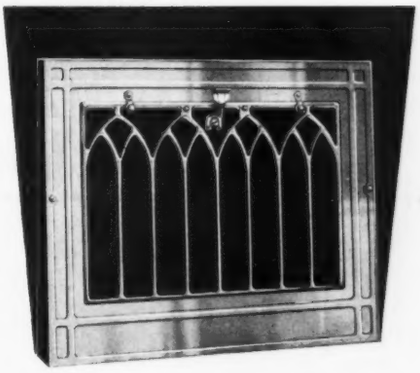
Get acquainted with our superior repair service NOW. We furnish ORIGINAL repairs for many makes of furnaces.

WRITE FOR THIS FREE ORDER BOOK

We have all the Patterns on the BUCK'S Furnaces and Stoves

A. G. BRAUER SUPPLY COMPANY

314-318 North Third Street St. Louis, Mo.



No. 110 Makes a Real Hit *With Nearly Every Prospect*

Registers that are merely "acceptable" to your prospects aren't doing a thing to benefit your cause. Forget them and handle only those that capture *enthusiastic* approval by virtue of their outstanding beauty of design, beauty of finish, and quality workmanship. Then you will have another "plus factor" aiding you in making sales and satisfied customers.

Try our new No. 110 series on your next prospect. It makes a decided hit practically every time; and the cost is no greater than that of other registers.

Complete Stocks at Leading Jobbers

HART & COOLEY Mfg. Co.

CHICAGO, 61 W. Kinzie St. NEW YORK, 101 Park Ave.
PHILADELPHIA, 1600 Arch St. BOSTON, 75 Portland St.
NEW BRITAIN, CONN.—NASHUA, N. H.
Factories at Holland, Michigan, New Britain, Conn., Nashua, N. H.

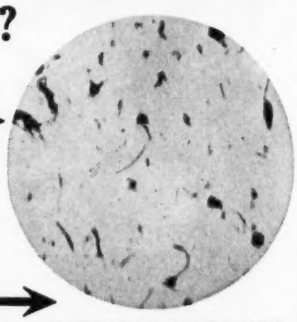
ALSO A COMPLETE LINE OF FURNACE REGULATORS, CHAIN, PULLEYS, DAMPERS, ETC.

HOW WOULD THE FURNACE YOU SELL LOOK IF IT WAS MAGNIFIED 200 TIMES?

THIS ← LIKE OR → THIS

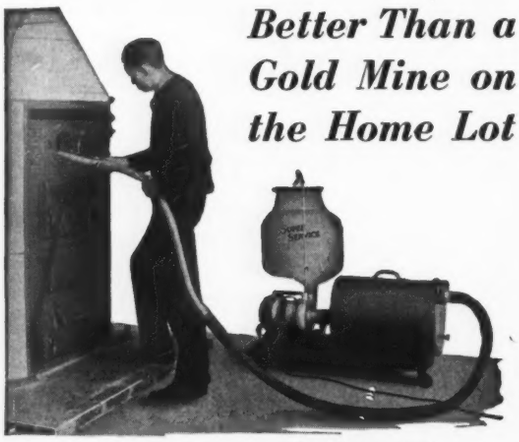
The photomicrograph at the left shows Cupola Iron magnified 150 times, illustrating conclusively why this type of metal has weak spots. Note the black spots. That is the free carbon present. Remember no metal is stronger than its weakest spot.

The photomicrograph at the right shows 'Lectromelt Iron magnified over 200 times. Very little free carbon is apparent. Note the density. Even strength throughout. Superior castings are always assured by the 'Lectromelt process.



ONLY BRILLION FURNACES LOOK LIKE THIS →

BRILLION FURNACE COMPANY, BRILLION, WISCONSIN



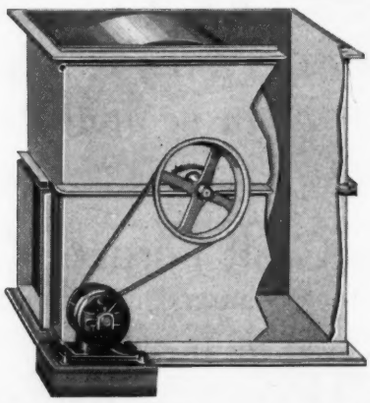
Better Than a Gold Mine on the Home Lot

This one-man outfit makes low overhead

THE SEASON is on. Others are making the good money in cleaning, and every furnace room shows more business. They *do* sell more repairs, overhauls and accessories. Many new furnaces are being spotted for delivery at convenience later. The orders never end for those who follow this trail.

You will double your business by this money-making approach. Write today for our *free trial* offer and a copy of the Plan Book—the easy guide to greater profits.

THE NATIONAL SUPER SERVICE CO.
1944 N. 13th St. Toledo, Ohio



Every Livewire Dealer Needs This Blower

—for added profits in forced air circulation!

NOW you can guarantee positive and uniform heat circulation in every room in the house. Am-pe-co, the improved Rotary Blower, has exclusive features that insure fully balanced air distribution to both inlets—vitally essential to perfect blower operation. Furnacestat or thermostat control; quiet; non-leaking ring oil bearings; low operating cost. Am-pe-co meets the need for a really efficient blower that will net the dealer a **good profit.**

Built with or without automatic dampers which open when blowers stop, for gravity circulation. Get a bigger share of this forced air business, and make more money. Send today for complete detailed literature.

AMERICAN MACHINE PRODUCTS COMPANY
Marshalltown, Iowa
For 15 Years Manufacturers of Precision Products

AM-PE-CO BLOWER

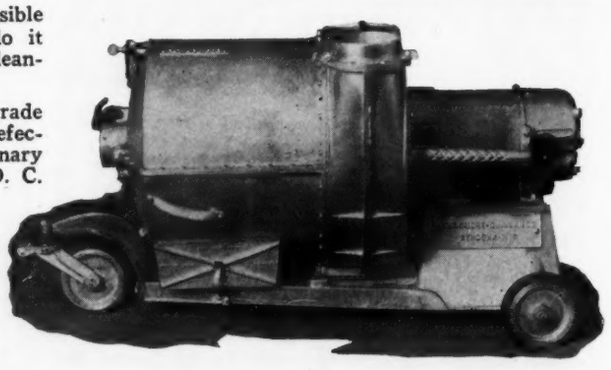
"D-Q" The MOST POWERFUL Suction Cleaner Made

THE extra power of the "D-Q" Cleaner makes it possible for you to do a REAL CLEANING job and to do it QUICKER. With the "D-Q" you can actually make the cleaning job itself pay you a profit.

It's ***light weight***—made of highest grade cast aluminum—***guaranteed*** against defective parts and it operates in ***any*** ordinary house lighting socket either A. C. or D. C. current from 110 to 125 volts.

Write today for our NEW four page folder which illustrates and describes the "D-Q" Super Suction Cleaner in detail.

DENSMORE-QUINLAN CO.
KENOSHA WISCONSIN



Say you saw it in AMERICAN ARTISAN—Thank you!

THE
"BIG THREE"
IN
AIR CONDITIONING

SILENTAIR FAN
(Blower Type)
SILENTAIR AIR WASHER
SILENTAIR AIR FILTER

Write for Literature

SILENTAIR
AIR CONDITIONING UNITS

Manufactured by
A. GEHRI & CO.
Tacoma, Washington

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Breuer's Ball Bearing
Tornado Furnace Cleaner

100 Per Cent of All Furnaces Need Cleaning

60 Per Cent of All Furnaces Need Repairing

Facts show that 60 per cent of all furnaces need repairing—but how much of this percentage do you get? The only sure way to get more repair business is by offering TORNADO Cleaning Service at a nominal charge.

You not only make a profit on the cleaning job but you are able to get into the basement and suggest repairs—and even sell new furnaces.

Protect and build your business with TORNADO Cleaning Service. It keeps customers satisfied and brings in new business. The TORNADO Furnace Cleaner is the lightest unit built—weighs only 30 pounds, a one man outfit—lowest in cost, only $149.50 complete—most powerful, oversized 2/5 H.P. G.E. Universal Motor mounted on Norma Precision Ball Bearings—10 gallon steel tank dust receptacle mounted on large castors, neatly polished aluminum lid and power unit—easily cleaned—just the cleaner to build profits at low cost. Write for complete information on our three days' free trial offer.

BREUER ELECTRIC MFG. CO.
865 Blackhawk St. Chicago, Ill.

IT PAYS

TO SELL AND
INSTALL THE

RELIABLE
RYBOLT
FURNACE

Rybolt has these advantages:

A name that for more than 25 years has identified dependable, satisfactory heating.

A high quality furnace that can be sold at a competitive price.

A one-piece radiator, of uniform thickness, with smoke and cleanout collars cast on . . . and many other advanced features of construction.

Year after year Rybolt dealers have profited greatly from the Rybolt franchise. The same opportunity is now offered to you. Write or wire for details of our interesting proposition.

THE RYBOLT HEATER COMPANY
Ashland, Ohio
Cincinnati Indianapolis

Orders for Rybolt Repair Parts promptly filled.

NO FLOAT ~ EASY TO INSTALL

NO FLOAT ~ EASY TO INSTALL

SIMPLEX HUMIDIFIER

"Truly Automatic"

Here's the Humidifier you should sell. No float to get out of order. Evaporation controls water flow. Easy to install. Adopted as standard equipment on many furnaces.

Write for our dealer, jobber or manufacturer proposition

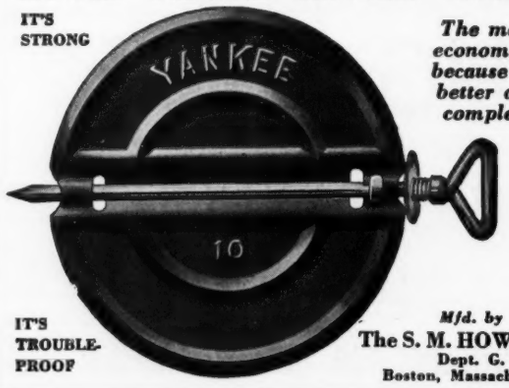
SALLADA MANUFACTURING CO.
720 South 4th St., Minneapolis, Minn.

"SIMPLEX"
Truly Automatic—

HOWES *YANKEE* HOT-AIR DAMPER

IT'S STRONG

The most economical because it's better and complete



IT'S TROUBLE-PROOF

Mfd. by
The S. M. HOWES CO.
Dept. G.
Boston, Massachusetts

"American Seal"

FURNACE CEMENT

Roof Cement—Stove Putty
Plumbers Putty

PAINTS AND SPECIALTIES

WILLIAM CONNORS PAINT MFG. CO.
Established 1852
TROY NEW YORK
JAMES L. PERKINS, Western Distributor
140 South Dearborn Street, Chicago, Illinois

Furblo

FOR EVERY WARM AIR HEATING INSTALLATION

There are three types in the 1931 line of Furblos. Type "A" shown below—the blower only—is for those who prefer to build their own outer casing. Another type has a square casing to conform to present-day square furnaces. Still another has side intake boxes—especially designed for most economical installation. All types have this in common: Performance data has been arrived at according to the rigid code of the A. S. H. & V. E. and is certified to be absolutely correct. May we send you ratings, prices or descriptive information? Write today.

Lakeside Company, Hermansville, Mich.
Makers of the Lakeside Ventilating System

Genuine Agricola

REPAIR PARTS

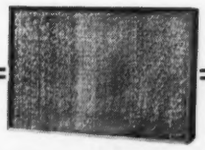
To be sure of perfect fitting castings and parts, order only genuine AGRICOLA Repair Parts. Prompt shipments.

AGRICOLA FURNACE CO., Inc.
Gadsden, Alabama
Offices in principal cities

File This Copy

When you have finished reading this issue of AMERICAN ARTISAN, pass it on to others in your organization, marking the articles in which they should be particularly interested.

Then file it for future reference. You never know when you will encounter a problem in your business that is covered in this very issue.



Gives Your Customers *KLEEN* Air

"KLEENAIRE" Filters

The new model Kleenaire is ready, operating more effectively than before. No dust or dirt can clog the Kleenaire. Free air flow always. Easy to install. Easy to clean.

Let us tell you all about the Kleenaire. Write today.

KLEENAIRE FILTER COMPANY
— STEVENS POINT, WIS. —
[*USES AIR REVERSAL PRINCIPLE*]

REGISTERS OF THE HOUR

AUER Quality Merchandise Is Your Satisfaction

There is an AUER Register and Grille for every need—the *Colonial*, *Aueristocrat*, *Economy*, and *Pro-Tex-Wall*—but the catalog will tell you better. Write for it today.

AUER REGISTER COMPANY
3608 Payne Avenue CLEVELAND, OHIO

It's Here . . .

The New MELLOW FURNACE

"America's perfect heating unit"

- ONE PIECE RADIATOR
- HEAVY CORRUGATED COMBUSTION DOME
- TWO SECTION HEAVY FIRE POT
- DUPLEX GRATE
- Many Other Superior Features

Write for the New Mellow Furnace Folder

LIBERTY FOUNDRY CO.
7600 Vulcan Street St. Louis, Mo.

The AUTOMATIC DRIP HUMIDIFIER

Entirely Different
Write for Details

Correct and Controlled Humidity

THE Automatic Drip Humidifier is unlike all others. The amount of humidity desired is *regulated*. It is simple, fool-proof, durable, reliable and high grade in every respect.

For every warm air heating installation and especially desirable with oil heat because of control feature.

For efficiency and profits sell the Automatic Drip Humidifier—send for complete information today.

AUTOMATIC HUMIDIFIER COMPANY
CEDAR FALLS, IOWA

THIS SMALL AD MEANS JUST AS MUCH TO YOU AS A FULL PAGE.

Write for Our New Catalog and Prices. Let Us Tell You "Y"

A COMPLETE LINE OF REGISTERS AND FACES FOR ALL REQUIREMENTS

SYMONDS REGISTER CO.
3117-23 Minnesota Avenue St. Louis, Mo.

Y—the—Y—in—SYmonds?

~ MARKET QUOTATIONS ~

AMERICAN ARTISAN is the only publication quoting Prices on Metals, Sheet Metal Equipment and Supplies, Warm Air Heating Supplies and Accessories, corrected bi-weekly. These quotations are not guaranteed but are obtained from reliable sources and reflect nation-wide market conditions at the time of going to press.

NOTE—These prices are Chicago Warehouse Prices to which must be added territory differentials

METALS

PIG IRON

Chicago Fdy., No. 2	$17.50
Southern Fdy. No. 2	17.01
Lake Superior Charcoal	27.04
Malleable	17.50

FIRST QUALITY BRIGHT CHARCOAL TIN PLATES

IC	20x28	112 sheets	$23.80
IX	20x28		27.45
IXX	20x28	56 sheets	14.95
IXXX	20x28		16.10
IXXXX	20x28		17.35

TERNE PLATES

	Per Box
IC 20x28, 40-lb. 112 sheets	$23.50
IX 20x28, 40-lb. 112 sheets	26.00
IC 20x28, 25-lb. 112 sheets	20.05
IX 20x28, 25-lb. 112 sheets	22.90
IC 20x28, 20-lb. 112 sheets	18.55
IV 20x28, 20-lb. 112 sheets	21.35

"ARMCO" INGOT IRON PLATES

No. 8 ga.—110 lbs.	$4.15
3/16 in.—100 lbs.	4.05
¼ in.—100 lbs.	3.85

COKE PLATES

Cokes, 80 lbs., base, 20x28	$12.00
Cokes, 90 lbs., base, 20x28	12.20
Cokes, 100 lbs., base, 20x28	13.75
Cokes, 107 lbs., base, IC, 20x28	12.75
Cokes, 135 lbs., base, IX, 20x28	14.75
Cokes, 155 lbs., base, 2X, 56 sheets	8.50
Cokes, 175 lbs., base, 3X, 56 sheets	9.35
Cokes, 195 lbs., base, 4X, 56 sheets	10.25

BLUE ANNEALED SHEETS

Base 10 ga.	per 100 lbs.	$3.35
"Armco" 10 ga.	per 100 lbs.	4.15

ONE PASS COLD ROLLED BLACK

No. 18-20	per 100 lbs.	$3.55
No. 22	per 100 lbs.	3.70
No. 24	per 100 lbs.	3.75
No. 26	per 100 lbs.	3.85
No. 27	per 100 lbs.	3.90
No. 28	per 100 lbs.	4.00

GALVANIZED

No. 16	per 100 lbs.	$3.85
No. 18	per 100 lbs.	4.00
No. 20	per 100 lbs.	4.15
No. 22	per 100 lbs.	4.20
(Standard differentials on extras to apply)		
No. 24	per 100 lbs.	$4.35
No. 26	per 100 lbs.	4.60
No. 27	per 100 lbs.	4.70
No. 28	per 100 lbs.	4.85
"Armco" 24	per 100 lbs.	5.85

BAR SOLDER

Warranted 50-50	per 100 lbs.	$19.25
45-55	per 100 lbs.	17.00
48-52	per 100 lbs.	17.75
Plumbers'	per 100 lbs.	15.50

ZINC

In Slabs $5.00

SHEET ZINC

Cask Lots (600 lbs.)	$12.00
Sheet Lots (100 lbs.)	13.00

BRASS

Sheets, Chicago base	16 ¾ c
Tubing, brazed, Chicago base	24 ⅞ c
Tubing, seamless, Chicago base	21 ⅝ c
Wire, Chicago base	17 ¼ c
Rods, Chicago base	15 c

COPPER

Sheets, Chicago base	19 ⅜ c
Tubing seamless, Chicago base	21 ⅞ c
Wire, plain rd., 8 B. & S. Ga. and heavier	12 ⅜ c

LEAD

American Pig	$6.00
Bar	7.50

TIN

Bar Tin	per 100 lbs.	$33.00
Pig Tin	per 100 lbs.	32.00

SHEET METAL SUPPLIES, WARM AIR FURNACE FITTINGS AND ACCESSORIES

ASBESTOS

Paper up to 1/16	5c per lb.
Roll board	5 ½ c per lb.
Mill board 3/32 to ⅛	5 ½ c per lb.
Corrugated paper (250 sq. ft. per roll)	$4.00 per roll

ASBESTOS SEGMENTS

8 in.	per 25 sets	$1.85
9 in.	per 25 sets	2.10
10 in.	per 25 sets	2.35
12 in.	per 25 sets	2.65

CEMENT FURNACE

5-lb. cans, net	$0.40
10-lb. cans, net	0.80
25-lb. cans, net	2.00
Per 100 lbs.	7.50

CLIPS

Damper

No-Rivet Steel, with tail pieces, per gross	$9.50
Rivet Steel, with tail pieces, per gross	7.50
Tail pieces, per gross	2.40

COPPER FOOTING

Copper Footing ..... 43 %

CORNICE BRAKES

Chicago Steel Bending

Nos. 1 to 6B ..... Net

CUT-OFFS

Gal. plain, round or cor. rd.

26 gauge	30 %
28 gauge	35 %

DAMPERS

Yankee Warm Air

7 inch, doz.	$1.60
8 inch, doz.	2.20
9 inch, doz.	2.60
10 inch, doz.	2.80
12 inch, doz.	3.50
14 inch, doz.	5.00

EAVES TROUGH

Galv. Crimpedge, crated	75-15 %
Zinc	60 %

ELBOWS

Conductor Pipe

Galv. plain or corrugated, round flat Crimp.

28 gauge	60-10 %
26 gauge	50 %
24 gauge	15 %

Galv. Terne Steel

Plain Rd. and Rd. Corr.

28 gauge	60-10 %
26 gauge	50 %
24 gauge	15 %

Square Corrugated

28 gauge	55 %
26 gauge	40 %

Portico Elbows

Standard Gauge Conductor Pipe, plain or corrugated.

Not nested	70 & 5 %
Nested solid	70 & 5 %

Sq. Corr., A. & B. & Octagon

28 gauge	55 %
26 gauge	40 %

Portico

1, 1¼, 1½ inch ..... 45 %

Copper

16 oz. all designs ..... 50 %

Zinc

All styles ..... 60 %

ELBOWS—Stove Pipe

1-piece Corrugated, Uniform Blue No. 28 Gauge,	Doz.
5 inch	$1.15
6 inch	1.25
7 inch	1.75

Adjustable—Uniform Blue

No. 28 Gauge, Uniform Blue.	
5 inch	$1.60
6 inch	1.75
7 inch	2.10

WOOD FACES—60 % off list.

FIRE POTS

	Each
No. 02 Gasoline Torch, 1 qt.	$ 5.18
No. 9250, Kerosene, or Gasoline Torch, 1 qt.	6.50
No. 10 Tinner's Furnace Square tank, 1 gal.	11.20
No. 15 Tinner's Furnace Round tank, 1 gal.	10.70
No. 21 Gas Soldering Furnace	8.00
No. 110 Automatic Gas Soldering Furnace	10.50

GLASS

Single and Double Strength, A, all brakets	85 %
Single and Double Strength, B, all brackets	87 %

HANGERS

Conductor Pipe

Milcor Perfection Wire	25 %
Milcor Triplex Wire	10 %

Eaves Trough

Steel (galv. after forming) from list	45 %
Selflock E. T. Wire, List	10 %

HOOKS

Conductor

"Direct Drive" Wrought Iron for wood or brick ..... 15 %

MITRES

Galvanized Steel Mitres

28 gauge	70-15 %
26 gauge	70-5 %

PASTE

Asbestos Dry Paste

200-lb. barrel	$14.00
100-lb. barrel	7.50
50-lb. pail	4.25
25-lb. pail	2.15
10-lb. bag	1.00
5-lb. bag	0.50

PIPE

Galvanized

Crated and nested (all gauges)	75-12 ½ %
Crated and not nested (all gauges)	75-7 ½ %

Furnace Pipe

Double Wall Pipe and Fittings	60 %
Single Wall Pipe, Round Galvanized Pipe	60 %
Galvanized and Tin Fittings	60 %

Lead

Per 100 lbs. $12.50

Stove Pipe

"Milcor" "Titelock" Uniform Blue Stove

28 gauge, 5 inch U. C. nested	$10.00
28 gauge, 6 inch U. C. nested	11.00
28 gauge, 7 inch U. C. nested	13.00
30 gauge, 5 inch U. C. nested	9.25
30 gauge, 6 inch U. C. nested	10.00
30 gauge, 7 inch U. C. nested	12.00

T-Joint Made Up

6 inch, 28 ga. ..... per doz. $3.40

REGISTERS AND FACES

Floor Registers

Steel and Semi-Steel	40 & 10 %
All Cast Iron	20 %

Baseboard

2-Piece	40 & 10 %
1-Piece	40-10 & 20 %

Adjustable Ventilators

Adjustable Ventilators ..... 40 & 10 %

COLD AIR FACES

Steel and Cast, less than 14" width	40 & 10 %
Steel, 14" and wider	65 & 10 %
Cast, 14" and wider	60 & 10 %
Special Cold Air Faces, Steel or Cast	40 & 10 %

RIDGE ROLL

Galv. Plain Ridge Roll, b'dld	75-15-5 %
Galv., Plain Ridge Roll, crated	75-15 %

SCREWS

Sheet Metal

7, ⅜ x ⅜, per gross	$0.52
No. 10, ¾ x 3/16, per gross	0.68
No. 14, ⅜ x ¼, per gross	0.83

SHEARS, TINNERS' AND MACHINISTS'

Viking $22.00

Lennox Throatless

No. 18	35 %
Shear blades	10 %
(f. o. b. Marshalltown, Iowa.)	

SHOES

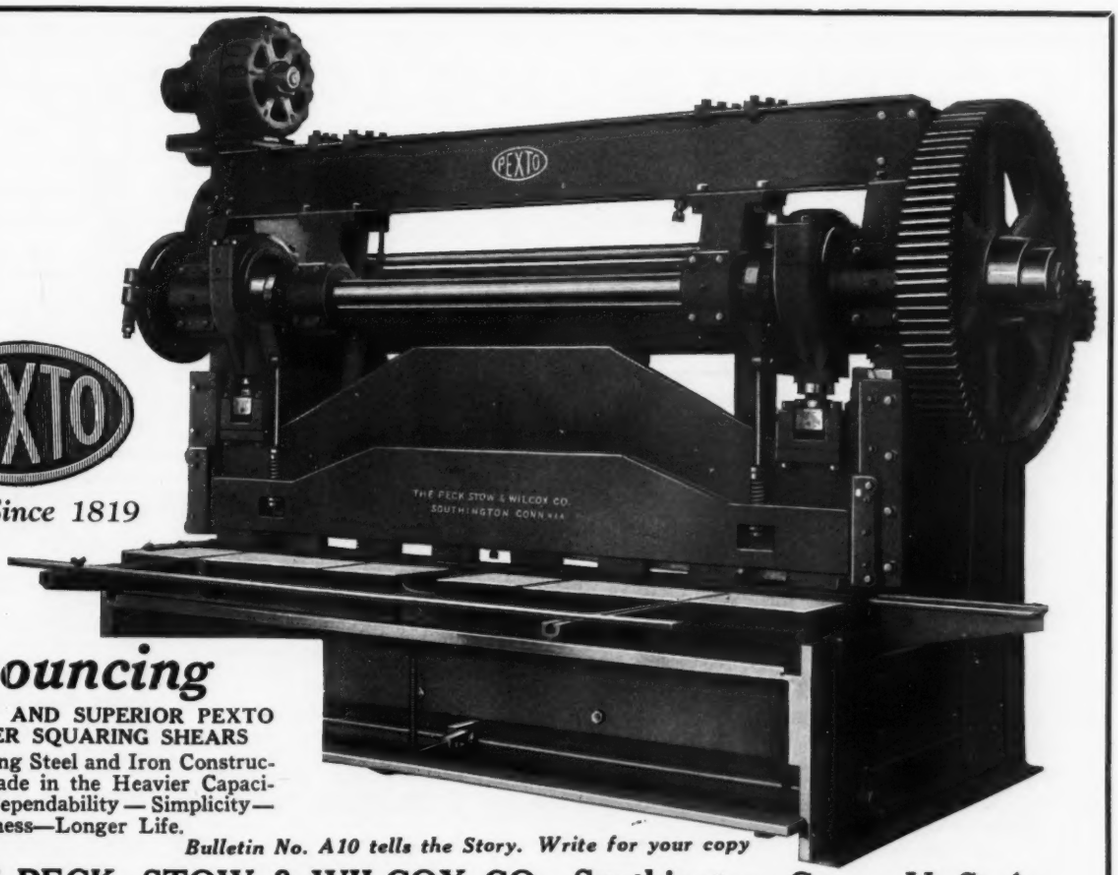
Galv. 28 Gauge, Plain or Corrugated, round flat crimp ..... 60-10 %
26 gauge, round flat crimp ..... 50 %
24 gauge, round flat crimp ..... 15 %

SNIPS

Tinners' ..... Net

VENTILATORS

Standard	30 to 40 %
Milcor	Net



PEXTO

Good Since 1819

Announcing

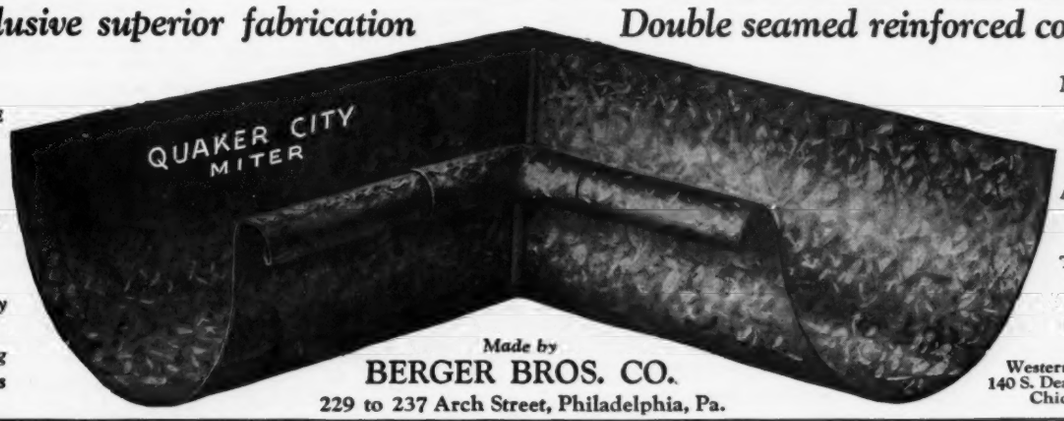
A NEW AND SUPERIOR PEXTO POWER SQUARING SHEARS

Combining Steel and Iron Construction—Made in the Heavier Capacities — Dependability — Simplicity — Ruggedness—Longer Life.

Bulletin No. A10 tells the Story. Write for your copy

THE PECK, STOW & WILCOX CO., Southington, Conn., U. S. A.

Exclusive superior fabrication ***Double seamed reinforced corner***



TRADE BB MARK

Sold by all leading Jobbers

Made in Galvanized Steel

ARMCO IRON

TONCAN METAL AND COPPER

Made by

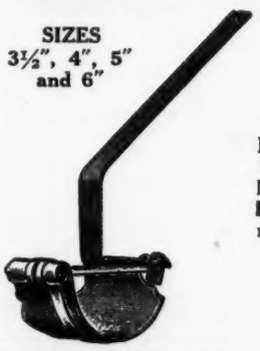
BERGER BROS. CO.

229 to 237 Arch Street, Philadelphia, Pa.

Western Office 140 S. Dearborn St. Chicago

OSBORN GOLDEN STAR

SIZES 3½", 4", 5" and 6"



HANGERS

Made in our own plant from 16 Ga. Galvanized Steel or Ingot Iron—Also Copper and Brass—are practical—economical—and easy to install!

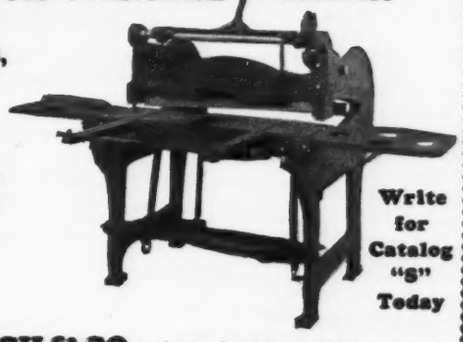
Let Us Send You a Sample

THE J. M. & L. A. OSBORN CO.
MANUFACTURERS - DISTRIBUTORS
DETROIT-CLEVELAND-BUFFALO
"Everything Used in Sheet Metal Work"

BERTSCH TREADLE SHEAR

SQUARES, TRIMS AND SLITS

all sheets 14 gauge or lighter



Write for Catalog "G" Today

BERTSCH & CO., Cambridge City, Ind.

BUYERS' DIRECTORY

Air Cleaners

American Fdy. & Furnace Co., Bloomington, Ill.
Independent Air Filter Co., Chicago, Ill.
Kleenaire Filter Co., Stevens Point, Wis.
Meyer & Bro. Co., F., Peoria, Ill.
Watt Mfg. Co., Sterling, Ill.

Air Washers

American Machine Products Co., Marshalltown, Iowa
Brundage Co., Kalamazoo, Mich.
A. Gehri & Co., Tacoma, Wash.
Watt Mfg. Co., Sterling, Ill.

Asbestos—Liquid

Technical Products Co., Pittsburgh, Pa.

Asbestos Covering

Standard Asbestos Co. of Chicago, Chicago, Ill.
Wilson, Grant, Inc., Chicago, Ill.

Asbestos Paper

Standard Asbestos Co. of Chicago, Chicago, Ill.
Wilson, Grant, Inc., Chicago, Ill.

Ash Sifters

Diener Mfg. Co., G. W., Chicago, Ill.

Blast Gates

Berger Bros. Co., Philadelphia, Pa.

Blowers

American Fdy. & Furnace Co., Bloomington, Ill.
American Machine Products Co., Marshalltown, Iowa
Brundage Co., Kalamazoo, Mich.
A. Gehri & Co., Tacoma, Wash.
Henry Furnace & Fdy. Co., Cleveland, O.
Lakeside Co., Hermansville, Mich.
Watt Mfg. Co., Sterling, Ill.

Bolts—Stove

Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Brakes—Bending

Dreis & Krump Mfg. Co., Chicago, Ill.
Interstate Machinery Co., Chicago, Ill.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Brakes—Cornice

Dreis & Krump Mfg. Co., Chicago, Ill.

Brass and Copper

American Brass Co., Waterbury, Conn.

Cans—Garbage

Diener Mfg. Co., G. W., Chicago, Ill.
Osborn Co., The J. M. & L. A., Cleveland, Ohio

Castings—Malleable

Fanner Mfg. Co., Cleveland, Ohio

Ceilings—Metal

Globe Iron Roofing and Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Chaplets

Fanner Mfg. Co., Cleveland, Ohio

Cleaners—Vacuum

Breuer Electric Mfg. Co., Chicago
Brillion Furnace Co., Brillion, Wis.
Densmore & Quinlan Co., Kenosha, Wis.
National Super Service Co., Toledo, Ohio
Osborn Co., The J. M. & L. A., Cleveland, Ohio
B. F. Sturtevant Co., Boston, Mass.

Conductor Elbows and Shoes

Barnes Metal Products Co., Chicago, Ill.
Berger Bros., Philadelphia
Globe Iron Roofing & Corrugating Co., Cincinnati, O.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Rockford Sheet Steel Co., Rockford, Ill.

Conductor Fittings

Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia
Braden Mfg. Co., Terre Haute, Ind.
Chicago Metal Mfg. Co., Chicago, Ill.
Globe Iron Roofing & Corrugating Co., Cincinnati, O.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Conductor Pipe

Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Globe Iron Roofing & Corrugating Co., Cincinnati, O.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Copper

American Brass Co., Waterbury, Conn.
Rockford Sheet Steel Co., Rockford, Ill.

Cornices

Globe Iron Roofing and Corrugating Co., Cincinnati, Ohio
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Crimping Machines

Bertsch & Co., Cambridge City, Ind.
Yoder Co., The, Cleveland, O.

Cut-offs—Rain Water

Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Dampers—Quadrants—Accessories

Aeolus Dickinson Chicago, Ill.
Hart & Cooley Co., Holland, Mich
Howes Co., S. M., Boston, Mass.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Parker-Kalon Corp., New York, N. Y.

Dampproofings

Lastik Products Corp., Pittsburgh, Pa.

Diffusers—Air Duct

Aeolus Dickinson Chicago, Ill.

Drills—Electric

J. M. & L. A. Osborn Co., Cleveland, Ohio
The Stanley Electric Tool Co., New Britain, Conn.

Drive Screws—Hardened Metallic

Parker-Kalon Corp., New York

Eaves Trough

Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Chicago Metal Mfg. Co., Chicago, Ill.
Globe Iron Roofing & Corrugating Co., Cincinnati, O.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Rockford Sheet Steel Co., Rockford, Ill.

Eaves Trough Hangers

Berger Bros. Co., Philadelphia, Pa.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Flanges

Chicago Metal Mfg. Co., Chicago, Ill.

Fluxes—Soldering

Kester Solder Co., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Forming Rolls

Bertsch & Co., Cambridge City, Ind.
Interstate Machinery Co., Chicago, Ill.

Furnace Cement

Connors Paint Mfg. Co., Wm., Troy, N. Y.
Lastik Products Corp., Pittsburgh, Pa.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Technical Products Co., Pittsburgh, Pa.

Furnace Chain

Hart & Cooley Co., Holland, Mich.

Furnace Cleaners—Suction

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Brillion Furnace Co., Brillion, Wis.
Densmore & Quinlan Co., Kenosha, Wis.
National Super Service Co., Toledo, Ohio
J. M. & L. A. Osborn Co., Cleveland, Ohio
B. F. Sturtevant Co., Boston, Mass.

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Fanner Mfg. Co., Cleveland, Ohio

Furnace Fans

A-C Mfg. Co., Pontiac, Ill.
American Fdy. & Furnace Co., Bloomington, Ill.
Brundage Co., The, Kalamazoo, Mich.
Lakeside Co., Hermansville, Mich.
Robinson Co., A. H., Massillon, Ohio
Watt Mfg. Co., Sterling, Ill.

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Independent Air Filter Co., Chicago, Ill.
Kleenaire Filter Co., Stevens Point, Wis.

Furnace Pipe and Fittings

Henry Furnace & Fdy. Co., Cleveland, Ohio
Meyer & Bro. Co., F., Peoria, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Peerless Foundry Co., Indianapolis, Ind.

Furnace Pokers

Fanner Mfg. Co., Cleveland, Ohio

Furnace Pulleys

Hart & Cooley Co., Holland, Mich.

Furnace Regulators

Hart & Cooley Co., Holland, Mich.
Modern Heat Regulator Co., Cleveland, Ohio
Minneapolis Honeywell Regulator Co., Minneapolis, Minn.
Noll Regulator Co., Youngstown, Ohio
White Mfg. Co., Minneapolis, Minn.

Furnace Rings

Forest City Foundries Co., Cleveland, Ohio

Furnaces for Gas or Oil

Dail Steel Products Co., Lansing, Mich.

Furnaces—Gas

American Fdy. & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
Calkins & Pearce, Columbus, Ohio
Henry Furnace and Foundry Co., Cleveland, Ohio
Lennox Furnace Co., Marshalltown, Iowa
Meyer Furnace Co., Peoria, Ill.
Robinson Co., A. H., Massillon, Ohio
Wise Furnace Co., Akron, Ohio
Western Steel Products Co., Duluth, Minn.

Furnaces—Gas Auxiliary

Calkins and Pearce, Columbus, O.
Forest City Foundries Co., Cleveland, O.

Furnaces—Oil Burning

Motor Wheel Corp., Heater Div., Lansing, Mich.

Furnaces—Warm Air

Agricola Furnace Co., Gadsden, Ala.
American Fdy. & Furnace Co., Bloomington, Ill.
Armstrong Furnace Co., Columbus, O.
American Furnace Co., St. Louis, Mo.
Brillion Furnace Co., Brillion, Wis.
Dail Steel Products Co., Lansing, Mich.
Deshler Foundry & Machine Works, Deshler, Ohio
Enterprise Boiler & Tank Works, Chicago, Ill.
Forest City Foundries Co., Cleveland, Ohio
Graff Furnace Co., Scranton, Pa.
Hall-Neal Furnace Co., Indianapolis, Ind.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Lennox Furnace Co., Marshalltown, Iowa
Liberty Foundry Co., St. Louis, Mo.
May Fiebeger Furnace Co., Newark, Ohio
Meyer Furnace Co., The, Peoria, Ill.
Midland Furnace Co., Columbus, Ohio
Motor Wheel Corp., Heater Div., Lansing, Mich.
Peerless Foundry Co., Indianapolis, Ind.
Premier Warm Air Heater Co., Dowagiac, Mich.
Round Oak Furnace Co., Dowagiac, Mich.
Rybolt Heater Co., Ashland, Ohio
Schwab Furnace & Mfg. Co., Cedar Grove, Wis.
Standard Fdy. & Furnace Co., De Kalb, Ill.
Waterman-Waterbury Co., Minneapolis, Minn.
Western Steel Products Co., Duluth, Minn.
Wise Furnace Co., Akron, Ohio

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Chicago Perforating Co., Chicago
Harrington & King Perforating Co., Chicago, Ill.
Hart & Cooley Co., New Britain, Conn.
Independent Register & Mfg. Co., Cleveland
Tuttle & Bailey Mfg. Co., New York
U. S. Register Co., Battle Creek, Mich.

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Harrington & King Perforating Co., Chicago, Ill.

Handles—Boiler

Berger Bros. Co., Philadelphia, Pa.

Handles—Soldering Iron

Hyro Mfg. Co., New York, N. Y.

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Modern Heat Regulator Co., Cleveland, Ohio
Noll Regulator Co., Youngstown, O.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
White Mfg. Co., Minneapolis, Minn.

Heaters—Cabinet

Motor Wheel Corp., Heater Division, Lansing, Mich.
Waterman-Waterbury Co., Minneapolis, Minn.

Heaters—School Room

Meyer Furnace Co., The, Peoria, Ill.
Western Steel Products Co., Duluth, Minn.
Waterman-Waterbury Co., Minneapolis, Minn.

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Automatic Humidifier Co., Cedar Falls, Iowa
Diener Mfg. Co., G. W., Chicago, Ill.
Meyer & Bro. Co., F., Peoria, Ill.
Sallada Mfg. Co., Minneapolis, Minn.

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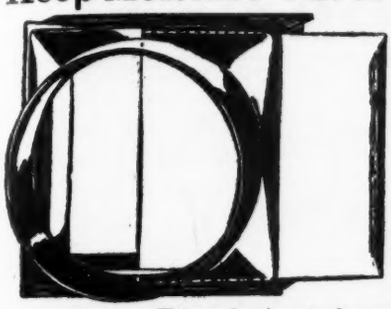

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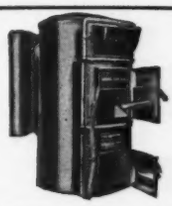

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Interstate Machinery Co., Chicago, Ill.

Machines—Tinsmith's

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Yoder Co., The, Cleveland, O.

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Harrington & King Perforating Co., Chicago, Ill.

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Interstate Machinery Co., Chicago, Ill.
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Tuttle & Bailey Mfg. Co., New York

Registers—Warm Air

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Hart & Cooley Co., Holland, Mich.
Henry Furnace & Fdy. Co. Cleveland, Ohio
Independent Register & Mfg. Co. Cleveland, Ohio
Meyer & Bro. Co., F., Peoria, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Rock Island Register Co., Rock Island, Ill.
Symonds Register Co., St. Louis, Mo.
Tuttle & Bailey Mfg. Co., New York
United States Register Co., Battle Creek, Mich.

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Auer Register Co., Cleveland, Ohio
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

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Lastik Products Corp., Pittsburgh, Pa.

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Lastik Products Corp., Pittsburgh, Pa.

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Osborn Co., The J. M. & L. A., Cleveland, Ohio
Republic Steel Corp., Youngstown, Ohio
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Republic Steel Corp., Youngstown, Ohio
Rockford Sheet Steel Co., Rockford, Ill.
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St. Louis Technical Institute, St. Louis, Mo.

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Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Parker-Kalon Corp., New York

Screens—Perforated Metal

Harrington & King Perforating Co., Chicago, Ill.

Scuppers

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Viking Shear Co., Erie, Pa.
Yoder Co., The, Cleveland, O.

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Republic Steel Corp., Youngstown, Ohio
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Solder—Rosin Core

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Solder—Self-Fluxing

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Soldering Furnaces

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Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

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Wise Furnace Co.* ....
Yoder Co., The* ....

THE BUYERS' DIRECTORY APPEARS ON PAGES 52 AND 54

Classified Advertising

BUSINESS CHANCES

Lightning Rods—Dealers who are selling Lightning Protection will make money by writing to us for our latest Factory to Dealer Prices. We employ no salesmen and save you all overhead charges. Our Pure Copper Cable and Fixtures are endorsed by the National Board of Fire Underwriters and hundreds of dealers. Write today for samples and prices. L. K. Diddie Company, Marshfield, Wis.

For Sale—West Side Sheet Metal Works of Cleveland, Ohio. Full set of tools, machines, stock on hand, and truck. First offer for $1700 cash takes the lot. Owner will retire. Good chance for a live wire mechanic. Address J. F. L., 2173 West 103rd Street, Cleveland, Ohio. F-536

Wanted—Small stock of hardware and plumbing in good town of 1000 to 4000. Not too much competition. Can invest up to $6000 if priced right. Might raise more if necessary. Address O-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

A modern sheet metal manufacturing shop, with up-to-date facilities desires connection with any person having a sheet metal article of merit to manufacture, patented preferred, adapted for western states, Oriental, or South American trade, we are located in a leading Pacific Coast city. Address O-537, American Artisan, 139 N. Clark Street, Chicago, Ill.

For Sale—Plumbing, heating and tin shop in one of the best towns in north east Nebraska and in the best farming community in the state. Will sell at a bargain if taken at once. Must sell on account of failing eyesight. Stock and tools about $4500. $1500 will handle it by the right party. Have done $30,000 business in a year. This is a snap for a good mechanic. Address D-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Ill.

For Sale—Sheet metal shop equipped fully to work all metals including 14 gauge steel in busy section of Chicago, close to several live suburbs. Reasonable rent—also priced reasonable. Address R-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Ill.

HELP WANTED

High grade furnace salesmen calling upon jobbing, sheet metal and furnace trade to handle a national line of Blowers and Air Conditioning equipment, as a full or part time occupation, on a commission basis. Address L-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Harry T. Klugel, North Emporia, Virginia, would be glad to hear promptly from Jack W. Davis, sheet metal worker, formerly of Richmond, Virginia. Anyone knowing of his whereabouts please advise. S-536

Manufacturers' Agents

Wanted to sell our furnace cement, roofing paint and cement and calking compounds. Our consistent trade paper advertising is creating demand. Exclusive territory given with liberal commission. Address X-536, AMERICAN ARTISAN, 139 N. Clark Street, Chicago, Illinois.

HELP WANTED

SALESMEN

High grade salesmen calling upon sheet metal and furnace trade, also oil burner dealers to handle a new, practical and moderately priced Furnace Filter as a full or part time occupation. Commission basis. Address Battle Creek Filter Company, Battle Creek, Mich. M-537

Wanted—Salesmen on straight commission basis for the following territories—Ohio, Indiana, Illinois, Iowa and Minnesota. Address Schwab Furnace & Manufacturing Company, Cedar Grove, Wisconsin. B-537

Wanted—Salesmen who call on warm air furnace trade to sell up-to-date line of warm air registers as side line on commission basis. Write for interesting proposition and state territory covered. Address F-537, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Wanted—Furnace salesman who has had experience selling to furnace dealers. Territory, Ohio, West Virginia, and Pennsylvania. In replying write to E-537, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois, stating experience, name of firms, term of employment, and also initial salary expected.

Wanted—Experienced stove and furnace salesman. Trade mark line for Illinois, Indiana, Michigan, and Ohio. State experience, age, salary, etc. Address H-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

SITUATION WANTED

Situation Wanted—Experienced sales supervisor, heating, air conditioning, ventilation, domestic and industrial worker, wants connection in East. Take charge of sales, build sales crew and new business. Remuneration on percentage basis. Lay out own work, age 33. Will take entire charge on profit sharing basis. Address S. K. Martin, c/o W. Derr, 206 Kelker Street, Harrisburg, Pennsylvania. K-536

Are you in need of a City Salesman? Ten years experience in selling high grade cast, steel, and gas fired furnaces, also sheet metal. Do own estimating and lay out work either forced or gravity. Will work on commission with drawing account allowed. Seven years with one manufacturer. Good references. Address M-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By an all round tinner, good furnace and gutter man. Steady, reliable, active, married, no children. Reasonable wages. Address P-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Ill.

SITUATION WANTED

Situation Wanted—Competent executive wishes position in any line of the sheet metal or warm air heating industry. Capable of taking full charge of entire business, general job shop, warm air heating, oil burner construction and erection, and metal stamping, including the manufacture of furnace fittings. Twenty years at business. Twelve years as executive. Now holding responsible position, but wish to change location. Permanent position in congenial environment desired. Location no object. Salary, $3500 to $4000 per year. Available in 90 days. College education. Address J-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By first class tinner and furnace man. One that can do plumbing or clerk in hardware store. Would go anywhere, but would prefer middle west. Fully capable of taking full charge of a general shop. Large and small town experience. Would consider a shop on percentage, if it has a good volume of furnace business. Address W-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By first class tinner and furnace man. Engineering knowledge of warm air heating, layout, and pattern cutting. Accustomed to both city and country work. Steady and of good habits. For further information write stating full particulars. J. D. Grace, Elmer, Missouri. C-536

Situation Wanted—By first class sheet metal woker. Experienced in general lines, cornices, heating and special work. Good pattern cutter. Neat and accurate on shop and bench work. Health and habits good. Would consider partnership. Address E-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

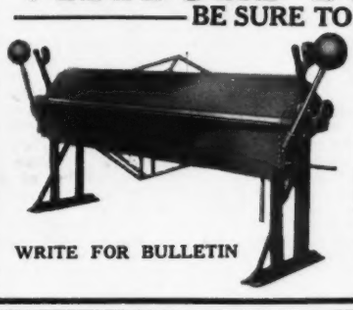
Situation Wanted—By a tinner. City and country experience. Address J. H. Dennick, Juda, Wisconsin.

Situation Wanted—By first class steam fitter, sheet metal worker, and furnace man. Can make estimates and layouts on steam, forced air, or gravity jobs. Have had twenty years experience in selling and installation. Married. Strictly sober. Address D-537, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By heating, ventilating and sheet metal man with twenty years experience. Capable of handling the large and difficult jobs as well as small ones. Experienced in fans, air washers, indirect steam, layout and pattern drafting. Have had gas furnace and gas appliance experience, selling and estimating. Have handled such jobs as high schools, theaters, government post offices, etc. Can take full charge. Prefer extreme southwest states but will go anywhere. Age 41. Good health and habits. References. Address H-537, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

VISITORS TO CONVENTION

BE SURE TO SEE OUR EXHIBIT



WRITE FOR BULLETIN

— Agents for —

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MARSHALLTOWN—BELOIT

THIS WEEK'S SPECIALS

10 Ga. Marshalltown Shear, $225.00.
59" Beloit Slip Roll 10 Ga. Cap., $225.00.
10 3/16 Niagara Motor Driven Power Shear.

Interstate Machinery Co.
130 South Clinton St. Chicago, Ill.

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is a source of
PROFIT THOUSANDS NEGLECT"

"We could make $50 to $500 additional each month in the year with a more perfect knowledge of Plans, Layouts, Estimating and Technical Research. Many is the job I turn down because of the 'fear' to tackle it," writes the son of a Shop Owner.
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SITUATION WANTED

Situation Wanted—By all around tinner, furnace and hardware man. Competent and experienced. References. Address J-537, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—Have been Superintendent of sheet metal shop for heating and ventilating company for eight years. Can make layouts, square casings, ducts and fittings for any residence forced air job. Address F. B. Howe, 31 West Home Street, Westerville, Ohio. Y-536

Situation Wanted—By general all around sheet metal worker. Prefer a jobbing shop. Thirty-eight years of age and married. Will go anywhere west of Chicago. Address Z-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By first class combination man. Middle Aged. Good salesman. Can handle shop if necessary. A-1 references. Can furnish all tools for heating and plumbing. Address K-537, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By a strictly first class all around sheet metal worker with 25 years' experience. Can lay out patterns, read blueprints and handle any kind of a job that may come to any sheet metal shop. Address Edward H. Collins, 417 Jones Street, Clearwater, Florida. L-537

TOOLS AND MACHINES

Wanted—One 8 foot or 10 foot steel cornice brake, 30 inch or 36 inch square shear, in good condition. Cash. Address G-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—Tinners bench machines and tools. Address P. C. Wold, Box 548, Pierre, South Dakota. T-536

MISCELLANEOUS

Wanted—Equipment for manufacturing metal culverts. Must be in good condition and reasonable. Address Sam H. Kerr, Lufkin, Texas. C-537

For Sale—2800 pounds Asbestos Paper 10 lb. weight, 36" wide in 100 lb. rolls—4c per pound, any amount, F. O. B. Rockford, Illinois. Address Lee N. Wagener, 1208 North Main Street, Rockford, Illinois. G-537

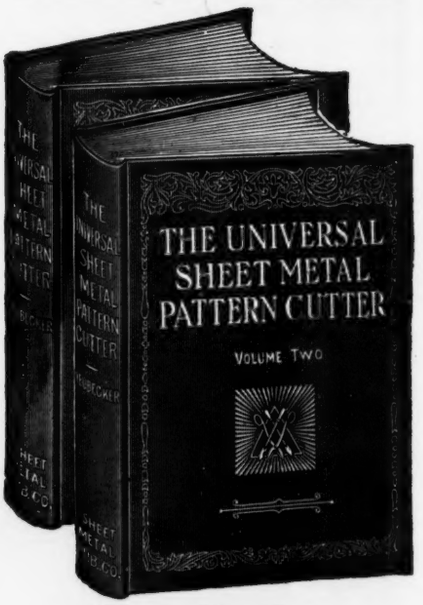
BOOKS

Here are the two books that most sheet metal workers and contractors classify as the most complete books on Sheet Metal Pattern Cutting. The Universal Sheet Metal Pattern Cutter, Vol. 1, deals with every phase of inside work, including Heating, Ventilating, Blower and Exhaust Piping Connections, Marine Sheet Metal Work, Automobile Sheet Metal Work, Machinery and Belt Guards, etc., Mensuration applied to Sheet Metal Work, etc., with many features of construction and Labor-Saving Methods are also given in detail.

Vol. 2 deals with every form of Outside and Architectural Sheet Metal Work. A treatise on Drawing, Full Size Detailing and Lettering, Construction of Cornices, Skylights, Molding, Copings, Electrically Illuminated Signs, etc.

Cloth bound, 400 pages each volume. Price, $7.50 per volume, postpaid. Order from Book Department. AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Standard Practice in Sheet Metal Work is the name of the big book written, compiled and published by the National Sheet Metal Contractors Association. It took years of hard, careful planning and work to produce this book. No other book like it—it describes and illustrates the standard method of designing, working and installing and erection of all forms of sheet metal work. Gutter construction of all kinds is shown in detail. Blow pipe work, skylight, roofing, cornice, ventilating, warm air heating, etc. It's the best $10.00 book investment you can make. No matter what other books you have you need this book. Order from the Book Dept., AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.



Two Books That Should Be In Every Sheet Metal Shop

Over 500 Practical Demonstrations and Several Thousand Methods with 1400 Engravings

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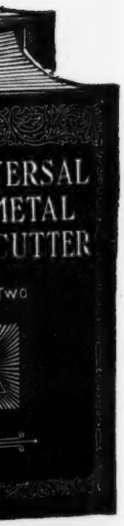

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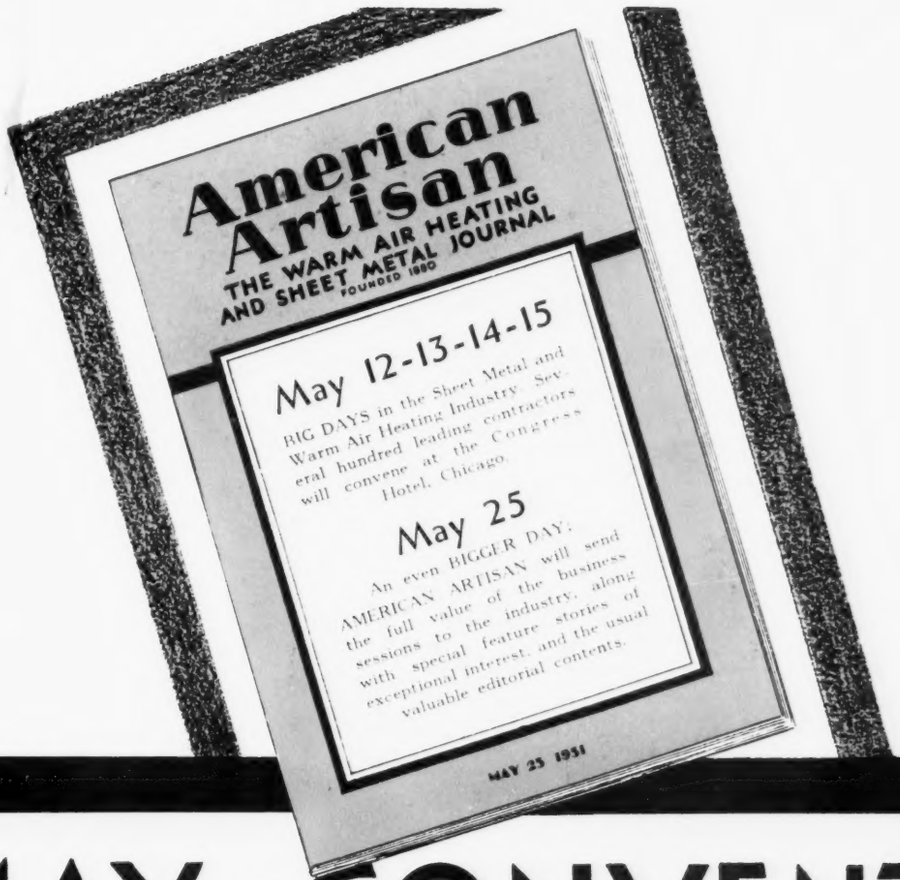
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An even BIGGER DAY. AMERICAN ARTISAN will send the full value of the business sessions to the industry, along with special feature stories of exceptional interest, and the usual valuable editorial contents.
MAY 25 1931

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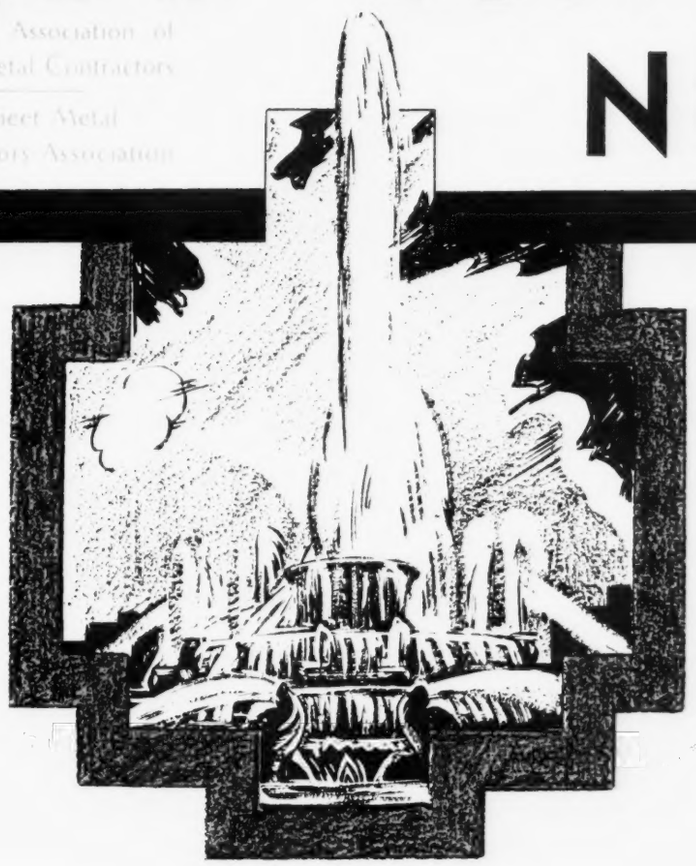

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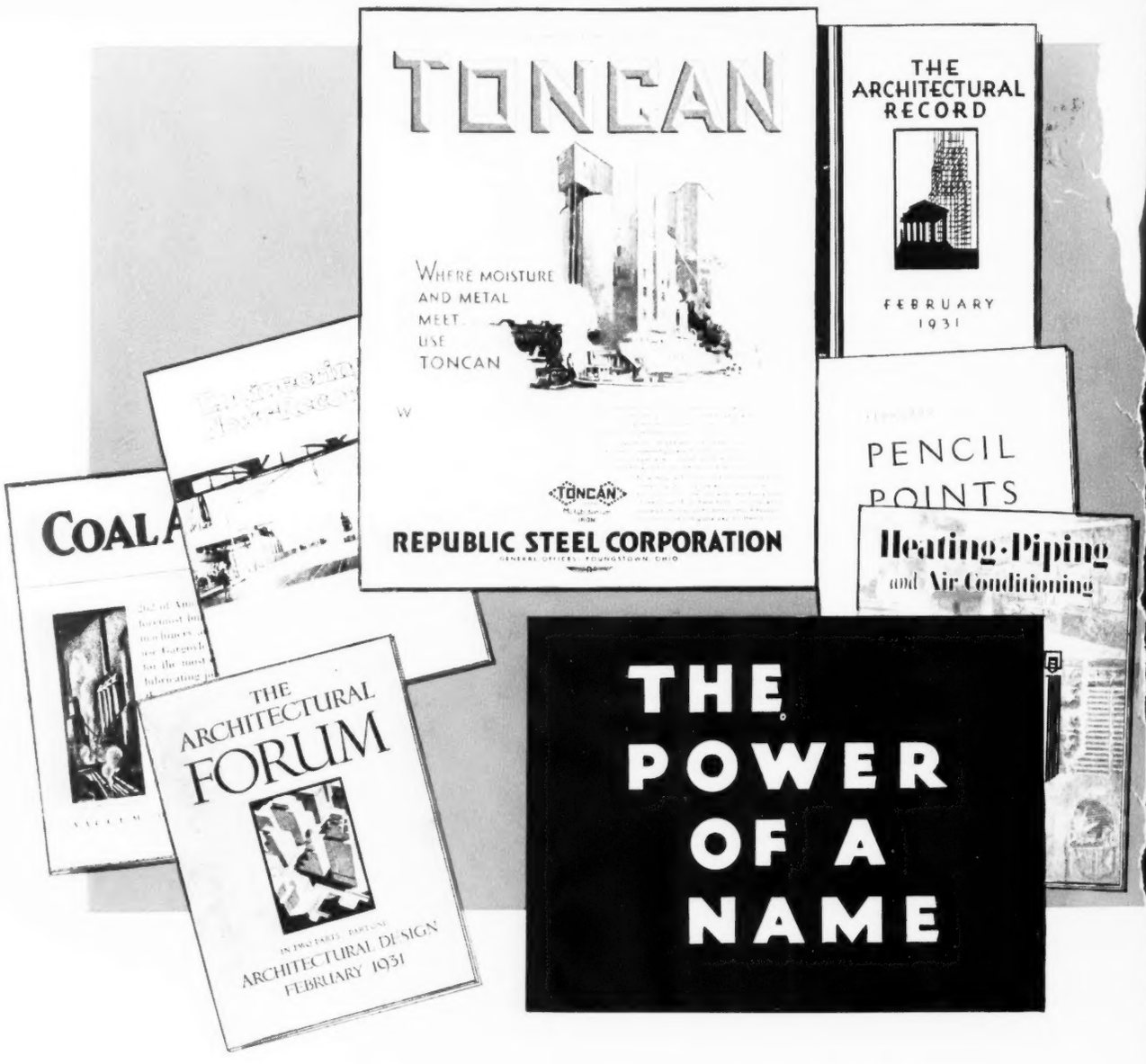

Sheet metal contractors everywhere who are using Toncan Iron for the thousand and one jobs for which it is the most suitable material know the sales power that lies in the name Toncan. Consider these facts and judge for yourself what a Toncan Master Craftsman sign on your place of business will mean in increased business.

Toncan Iron is a rust and corrosion resistant alloy of refined iron, copper and molybdenum. It represents more than twenty years of metallurgical development. Hundreds of thousands of dollars have been invested in advertising it in farm, home and industrial publications with the result that this longer lasting sheet metal is now associated indelibly in the minds of buyers with quality work. It has become a definite force in getting business, and the right kind of business, too—not the profitless job let only on price.

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